FLORA OF INDIA

VOLUME 12

ASTERACEAE

(Anthemideae - Heliantheae)

BOTANICAL SURVEY OF INDIA

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Editors

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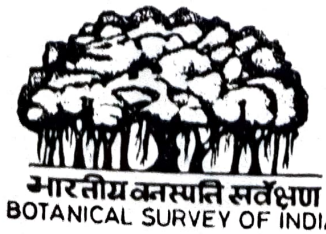

BOTANICAL SURVEY OF INDIA

CALCUTTA

CONTENTS

Preface	i
Contributors and Editors	iii
Abbreviations	iv
List of illustrations	v
ASTERACEAE	1
ANTHEMIDEAE	3
ASTEREAE	76
CALENDULEAE	147
CARDUEAE	150
CICHORIEAE	226
EUPATORIEAE	345
HELIANTHEAE	358
Index to botanical names	433
Index to common names	451

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PREFACE

Continuing with the present series on Flora of India, the editors now take pleasure in presenting the volume on Asteraceae, one of the largest flowering plant families in India, comprising about 1052 taxa in 161 genera (excluding the cultivated ones). In view of its large size the treatment is being presented in two volumes, i.e. Volumes 12 and 13. The entire family is treated under 12 tribes, viz. Anthemideae, Astereae, Calenduleae, Cardueae, Cichorieae, Eupatorieae, Heliantheae, Inuleae, Mutisieae, Senecioneae, Tageteae and Vernonieae. Some of the tribes, such as Cichorieae and Senecioneae, have been further segregated into a number of subtribes. While the delimitation of the tribes has been based on phylogenetic considerations, they are arranged in alphabetical sequence in conformity with the format adopted in the preceeding volumes. Similarly, the subtribes, genera, sections, species and infraspecific categories have been arranged alphabetically under respective tribe, subtribe, genus, section or species. The Volume 12 deals with 525 species in 105 genera and 7 tribes, whereas the remaining taxa would constitute the Volume 13.

The editors express their gratitude and appreciation to Dr. T.N. Khoshoo, Emeritus Scientist, and Ex-Secretary, Ministry of Environment & Forests, Govt. of India, who had been the guiding force behind the preparation of Flora of India in its present pattern and gave constant encouragement and facilities during the formative period. They are also thankful to Mr. N.R. Krishnan, I.A.S., Secretary, and Mr. R. Rajamani, I.A.S., Ex-Secretary, Ministry of Environment & Forests, Govt. of India, for the encouragement and facilities received for the continuation of this work. The editors are also thankful to Dr. S.K. Jain, F.N.A., Scientist Emeritus, and Ex Director, Botanical Survey of India, who, by initiating the series 'Fascicle of Flora of India', provided a nucleus for the present work; and to Dr. M.P. Nayar, and Dr. B.D. Sharma, Ex-Directors, Botanical Survey of India, for initiation and continuation of the project, formulation of guidelines and the encouragement and facilities provided to us and the contributors.

The editors also express their thanks to Mr. A.R.K. Sastry, Scientist-SF, Publication Division, Botanical Survey of India, Calcutta for his valuable help in various ways during the entire work, from formulation of guidelines to the publication.

The editors record their appreciation for the hard work put in by various contributors. They also express their thanks to Mrs. R. Mathur, Senior Scientific Assistant, Mr Bhola Ram, Ex-Chief Artist, Botanical Survey of India, and Mr Dev Raj Agarwal, Photographer, Botanical Survey of India, Northern Circle, Dehra Dun, for their help in various ways.

The editors acknowledge the efficient work done by Mr. Sanjay Uniyal, Data Entry Operator at the Computer Unit of Botanical Survey of India at Northern Circle, Dehra Dun in computer typesetting of the manuscript, and the help rendered by Mr. A.K. Pathak, System Analyst, Botanical Survey of India, Southern Circle, Coimbatore, in formatting the data in the initial stage. The editors also record their deep appreciation and gratitude to all the present and retired staff members of Botanical Survey of India in general, and those of Northern Circle, Dehra Dun in particular for their hardwork and wholehearted cooperation which greatly helped us in achieving the objective.

Finally we acknowledge the quick printing of this volume in final form by Deep Printers, New Delhi.

Calcutta

23.03.1995

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sterile, 5-dentate. Anther bases sagittate. Style arms undivided. Achenes oblong, 1-1.5 cm long, curved, outer ones warty ribbed, inner ones prickly warty.

Fl. & Fr. March - May.

Distrib. India: Cultivated and often run wild near cultivated fields and fallows in Northern India, 500-900 m. Punjab, Haryana and Uttar Pradesh.

China, Pakistan, Afghanistan and Europe.

Note. A native of Mediterranean region, mostly grown for yellow or orange, ornamental flower heads.

Tribe 4. C A R D U E A E Cass.

(Cynaroideae)

(P.K. Hajra)

Herbs, mostly thistle like. Leaves alternate, sinuate, lobed or divided, rarely entire, mostly spiny or prickly. Heads mostly large, homogamous with tubular, fertile or rarely dioecious flowers. Involuccral bracts imbricate in many rows, prolonged into a spine or bristle or with membranous edges. Receptacle thick, hard or fleshy, bristly or hairy, rarely naked. Corolla deeply cleft. Anthers sagittate at base, appendages elongated. Style branches short, commonly united up to the obtuse or acute tips. Achenes usually narrow or flat.

Basically northern hemisphere and old world, a few genera common in the New World in both North and South America; ca 50 genera and 1500 species, 21 genera and 119 species in India.

Literature. BENTHAM, G., (1873). Notes on classification, History and Geographical distribution of compositae (Cynaroideae) J. Linn. Soc. Bot. 13: 466-471.

Note. Echinops, being quite distinct from all other genera of the tribe, is often treated as a separate tribe Echinopsideae.

KEY TO THE GENERA

1a.	Heads one flowered, crowded into involucrate, globose balls	**11. Echinops**
b.	Heads many flowered, separate	2
2a.	Leaves spiny	3
b.	Leaves not spiny	10

3a.	Involucre bracteate at base by spinous leaves; basal areole oblique or lateral	**6. Carthamus**
b.	Involucre not bracteate as above; basal areole horizontal	4
4a.	Leaves white veined; filaments connate below into a sheath	**19. Silybum**
b.	Leaves not as above; filaments free	5
5a.	Pappus hairs free	**9. Cousinia**
b.	Pappus hairs connate into a ring at the base	6
6a.	Receptacle with deep pits having dentate margins	**16. Onopordum**
b.	Receptacle not pitted	7
7a.	Pappus hairs feathery	8
b.	Pappus hairs not feathery	9
8a.	Heads bisexual	**8. Cirsium**
b.	Heads unisexual	**4. Breea**
9a.	Filaments hairy	**5. Carduus**
b.	Filaments glabrous	**15. Olgaea**
10a.	Involucral bracts with hooked bristles	**3. Arctium**
b.	Involucral bracts without hooked bristles	11
11a.	Achenes with 3-concentric ridges below the top	**21. Zoegia**
b.	Achenes without concentric ridges	12
12a.	Heads heterogamous (rarely homogamous)	13
b.	Heads homogamous	15
13a.	Achenes 10-15-costate	**2. Amberboa**
b.	Achenes compressed, subcylindrical, 4-angled or 4-5-costate	14
14a.	Cauline leaves pinnatisect into linear segments; involucral bracts not appendaged; achenes villous	**10. Crupina**
b.	Cauline leaves various; involucral bracts often appendaged; achenes glabrous or pubescent	**7. Centaurea**
15a.	Outer involucral bracts with ovate-lunulate, searious, appendage; inner with oblong appendage	**1. Acroptilon**
b.	Involucral bracts not appendaged as above	16
16a.	Basal areole oblique or lateral	17
b.	Basal areole horizontal	18
17a.	Filaments glabrous	**18. Serratula**
b.	Filaments papillose	**20. Tricholepis**
18a.	Filaments hairy	**12. Goniocaulon**
b.	Filaments glabrous	19
19a.	Pappus hairs many-seriate, rough or feathery	**14. Jurinea**
b.	Pappus hairs 1-seriate, simple or feathery	20
20a.	Perennials; receptacle flat or convex, densely paleaceous, setose or rarely naked; pappus 1-2-seriate, plumose	**17. Saussurea**
b.	Biennials; receptacle more or less flat, setose; pappus 2-seriate, outer dimidiate	**13. Hemistepta**

1. Acroptilon Cass.

Herbs, perennial, rhizomatous. Heads homogamous, solitary, terminal. Involucral bracts many-seriate, appendaged. Florets hermaphrodite, tubular. Achenes obovoid, indistinctly striate. Pappus caducous, barbellate or plumose; outer shorter; inner elongate.

Orient, C. Asia; 2 species, 1 in India.

Acroptilon repens (L.) DC., Prodr. 6: 663. 1837. *Centaurea repens* L., Sp. Pl. 916. 1753.

Herbs upto 50 cm high; stems and branches striate, densely leafy. Leaves oblong-lanceolate to linear, entire or remotely dentate, recurved, on the margins, upto 15 x 3 mm, sessile. Involucral bracts many seriate; outer with broadly ovate to lunulate, scarious, appendage; inner with oblong appendage; appendage densely ciliate on back and margins. Corolla pink or violet. Achenes obovoid, ca 3 mm long, smooth. pappus twice as long as the achenes.

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, 1500-3000 m. on grassy, moist soil. Jammu & Kashmir.

Pakistan, Iran, C.I.S. and N. America.

2. Amberboa (Pers.) Less.

Annuals. Leaves alternate. Heads heterogamous, purple, violet or blue. Ray florets 1-seriate, neutral. Disc florets bisexual, fertile tube slender, short; limb cylindric, 5-fid. Involucral bracts many-seriate; outer shorter, acute, awned or spinescent; innermost narrow, acute. Receptacle flat, densely bristly. Filaments glabrous or hairy; anther bases sagittate, auricles connate, shortly tailed. Style filiform; arms free or connate. Achenes obovoid or oblong, subulate or angled, 5-15-ribbed. Pappus bristles many-seriate; outermost shorter; innermost 2-4, dialated and flattened.

Mediterranean to C. Asia; ca 20 species, 2 in India.

Literature. ILJIN, M.M. (1932). A critical survey of the genus *Amberboa* Less. *Bull. Jord. Bot. Acad. Sci.* URSS 30: 101-116. (In Russian with a brief English resume). SHARMA, A.M. (1982). *J. Econ. Tax. Bot.* 3(2): 529.

KEY TO THE SPECIES

1a. Heads ca 1.2 cm across — **2. A. ramosa**
b. Heads ca 2 cm across — **1. A. moschata**

1. Amberboa moschata (L.) DC., Prodr. 6: 560. 1838. *Centaurea moschata* L., Sp. Pl. 909. 1753.

Herbs, annual or biennial, up to 70 cm high, sparingly branched. Basal leaves undivided, rarely lobed, remotely dentate, petiolate; upper pinnately lobed to pinnatisect, dentate, sessile. Heads long peduncled, ca 2 cm across. Inner bracts with broadly ovate appendage. Corolla pink. Achenes without pappus.

Fl. & Fr. Jan. - April.

Distrib. India: Punjab.

S.W. Asia and Europe.

Note. Usually cultivated as an ornamental plant, sometimes found as an escape. There is no specimen in BSD and DD.

2. Amberboa ramosa (Roxb.) Jafri in Scientist 3: 29. 1959. *Carduus ramosus* Roxb., Fl. Ind. 3: 407. 1832. *Volutarella ramosa* (Roxb.) Sant., Pl. Saurashtra 22. 1953. *V. divaricata* (DC.) Benth. & Hook.f., Gen. Pl. 2: 416. 1873; Hook.f., Fl. Brit. India 3: 383. 1881. *Microlonchus divaricatus* DC., Prodr. 6: 562. 1838. *Tricholepis procumbens* Wight, Ic. t. 1139. 1846. **Fig. 44.**

Hindi: *Badaward;* Mar.: *Sakaji.*

Herbs, straggling, dichotomously branched, spreading; branches 2.5-5 cm long, angled, smooth or scabrid. Leaves usually oblong or obovate, entire, toothed or pinnatifid, 2.5-5 x 0.6-1.5 cm; lobes mucronate, often undulate or crisped. Heads ca 1.2 cm across. Involucral bracts ovate, with long spreading or recurved spinescent awns, glabrate, reddish; spines ca 6-8 mm long, smooth. Receptacular bristles short. Corolla ca 1.2 cm long, straight, pale purple. Achenes narrow ca 5 mm long, 4-5-angled, grooved and punctate between angles. Pappus silvery brown ca 1.2 cm long.

Fl. & Fr. April - Dec. (Jan. - March).

Distrib. India: On dry stony ground and sandy river banks, upto 1000 m. Uttar Pradesh, Bihar, Orissa, Madhya Pradesh, Rajasthan, Andhra Pradesh, Karnataka and Tamil Nadu.

Pakistan and Afghanistan.

Note. Plant is used as tonic, aperient, deobstruent, febrifuge, slightly mucilaginous and used in coughs (Chopra *et al.*, 1956).

3. Arctium L.

Herbs, erect, branched. Leaves radical or cauline. Heads homogamous, solitary or fascicled, terminal. Flowers all similar, bisexual, fertile, tubular, purplish; limb cylindric, 5-fid. Involucral bracts many-seriate, appressed, tips subulate, spreading, glochidiate. Receptacle flat, densely bristly. Filaments glabrous; anther bases sagittate;

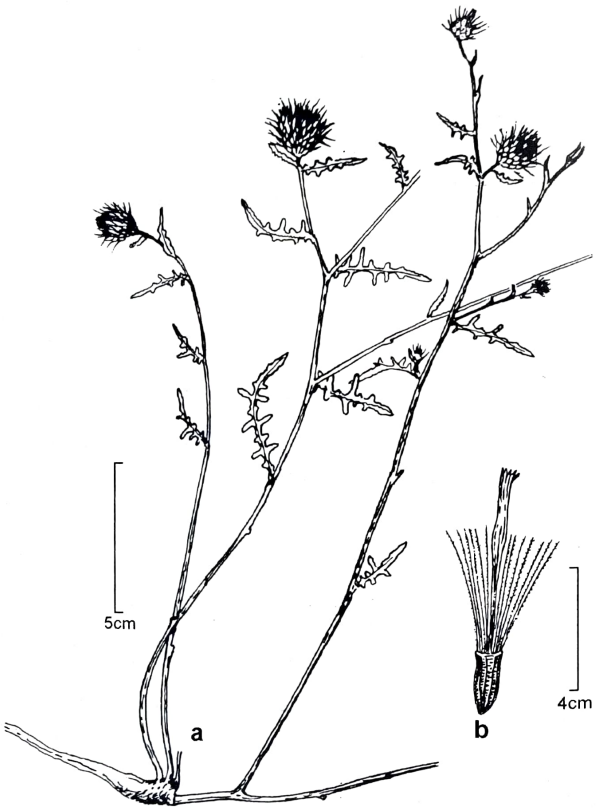

Fig. 44. Amberboa ramosa (Roxb.) Jafri : a. Habit; b. Achene.

tails setaceous. Style arms linear. Achenes oblong, subtriquetrous, many ribbed, glabrous, shining, truncate, base unequal. Pappus hairs short, serrulate, deciduous.

Eurasia; ca 6 species, 1 in India.

Literature. ARENES, J. (1950). *Bull. Jard. Bot. Bruxelles* 20: 67-156.

Arctium lappa L., Sp. Pl. 816. 1753; Hook.f., Fl. Brit. India 3: 359. 1881. **Fig. 45.**

Herbs, 60-120 cm high. Leaves ovate-cordate, usually cottony beneath, sinuate at margins, 3-15 x 5-30 cm; petiole 1-10 cm long. Heads ca 1.8-3.8 cm across, subcorymbose, glabrous or cottony; peduncle 1-2.5 cm long, stout. Involucre globose in bud; bracts slender, subulate, hooked at tip spreading. Corolla and stamens purple. Style white. Achenes grey mottled with black, 6-7 mm long, angled and ribbed. Pappus ca 2 mm long.

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas, on open hill slopes, 3700-4300 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal, Pakistan and Afghanistan.

Notes. Roots medicinal.

4. Breea Less.

Herbs, erect, leafy. Leaves alternate, sinuate-pinnatifid. Heads solitary, fascicled or corymbose. Flowers usually unisexual, purplish. Involucre ovoid, globose or hemispheric bracts many-seriate; outer usually foliaceous, spiny; inner gradually longer, usually with recurved tips; innermost scarious. Receptacle bristly. Filaments hairy or glabrous. Anther bases sagittate. Style arms short. Achenes obovoid, glabrous. Pappus hairs feathery.

W. & N. Asia, China, Europe. 1 in India.

Breea arvensis (L.) Less., Syn. Comp. 9. 1832. *Serratula arvensis* L., Sp. Pl. 820. 1753. *Crisium arvense* (L.) Scop., Fl. Carn. ed. 2, 2: 126. 1772. *Cnicus arvensis* (L.) Roth, Catalecta B. 1: 115. 1797. *C. candicans* Wallich, Cat. n. 2893. 1831. **Fig. 46.**

Beng.: *Sialkanta;* Eng.: *Canada thistle.*

Herbs, erect, 60-90 cm high. Stems many from base, usually simple, leafy, cobwebby tomentose above. Leaves sinuate or pinnatifid, 7.5-12.5 cm long, more or less

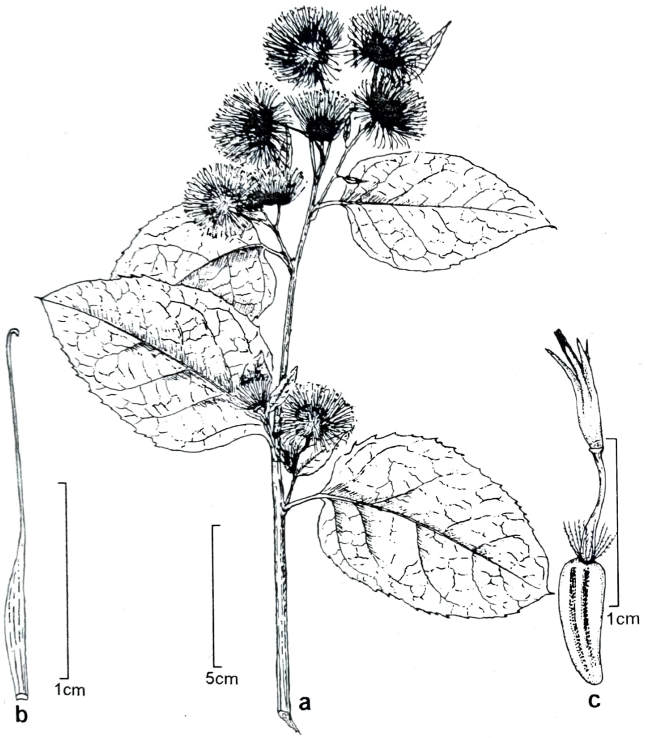

Fig. 45. **Arctium lappa** L. : **a.** Habit; **b.** Involucral bract; **c.** Floret.

Fig. 46. **Breea arvensis** (L.) Less. : **a.** Habit. **b.** Floret.

woolly beneath. Heads solitary, fascicled or corymbose, variable; male ca 1.2-2.5 cm across, globose; female much longer, campanulate. Involucral bracts glabrate or cobwebby; outermost short, ovate or triangular-ovate, ending in a short spine; inner gradually longer with undulate, often recurved tips; innermost narrow, linear-lanceolate, scarious. Corolla purplish. Achenes smooth, shining. Pappus brownish white.

Fl. & Fr. Feb. - May.

Distrib. India: Up to ca 1500 m. Jammu & Kashmir, Himachal Pradesh, Punjab, Uttar Pradesh, W. Bengal and Bihar.

Asia, Europe and introduced in N. America.

Note. Breea has been segregated from *Cirsium* on account of its unisexual florets and partial dioecy. This is a very variable species. The plant is used to coagulate milk.

5. Carduus L.

Herbs, annual or perennial, erect, usually spiny winged. Leaves alternate, pinnatifid, spinescent. Heads more or less globose, solitary, long peduncled or subsessile, scattered or crowded, homogamous. Flowers usually all bisexual and fertile, white, yellow or red; tube slender; limb equal or oblique, 5-fid. Involucre ovoid hemispheric or globose; bracts many-seriate, appressed or recurved, spinescent. Receptacle flat or convex, densely bristly. Filaments hairy or glabrous. Anther bases sagittate; auricles connate; tails slender. Style arms short, rarely filiform, obtuse. Achenes obovoid, glabrous, obtusely 4-angled, smooth or 5-10-ribbed. Pappus copious, hairs many-seriate.

European; ca 100 species, 4 in India.

Literature. KAZMI, S.M.A. (1964). Revision der Gattung Carduus (Compositae) Mitt. B. Staatssamm. Munchen 5: 275-350.

KEY TO THE SPECIES

1a. Heads usually 2.5-4 cm across; corolla 2 cm long **2. C. edelbergii**
b. Heads usually 1.5-2 cm across; corolla less than 2 cm long 2
2a. Involucral bracts ovate-lanceolate, glabrous, smooth; corolla ca 1 cm long **4. C. tenuiflorus**
b. Involucral bracts usually linear-subulate, hairy; corolla ca 1.5 cm long 3
3a. Heads cylindric; achenes ca 5 mm long; pappus ca 1.5 cm long **3. C. pycnocephalus**
b. Heads subglobose, usually in clusters of 2-4; achenes ca 4 mm long; pappus ca 1 cm long **1. C. crispus**

1. Carduus crispus L., Sp. Pl. 821. 1753.

Herbs, biennial up to ca 1 m high, sparsely hairy, winged; wings ca 5 mm wide, triangular with an apical spinula. Leaves lanceolate to oblanceolate, glabrescent above,

hairy or glabrescent beneath, lobed or crenate-dentate. Heads ca 1.5-2 cm across, subglobose, usually in clusters of 2-4; peduncles narrowly winged, up to ca 8 cm long. Involucral bracts imbricate, linear-subulate recurved at apex. Corolla ca 1.5 cm long. Achenes ca 4 mm long. Pappus ca 1 cm long.

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas. Jammu & Kashmir.

Europe.

2. Carduus edelbergii Rech. f. in K. Danske Vid. Selsk. Biol. Skr. 8(2) Symb. Afghan. 2: 175. 1955. *C. lucidus* Wallich *nom. nud. C. edelbergii* Rech.f. subsp. *lanatus* Kazmi in Mitt. B. Staatssamm. Munchen 5: 344. 1964. *C. nutans* (*auct. non* L.) Hook.f., Fl. Brit. India 3: 361. 1881. **Fig. 47.**

Biennial, 30-100 cm (-2 m) high, stout. Stems interruptedly winged; wings spinulous. Leaves very variable pinnatifid, entire, waved spinous, 5-30 x 1.5-4.5 cm. Heads 2.5-4 cm across, solitary or fascicled. Involucre hemispheric or subcampanulate; involucral bracts subulate-lanceolate, usually spiny at tip, reflexed, 1-1.8 cm long. Flowers ca 2 cm long, pink or dark purple. Achenes pale-brown, ca 5 mm long, glabrous, granulate. Pappus ca 1.5 cm long, dull white.

Fl. & Fr. June - Aug.

Distrib. India: W. Himalayas. Jammu & Kashmir and Himachal Pradesh.

Pakistan and Afghanistan.

Note. According to some authors the Himalayan species is intermediate between *C. nutans* and *C. crispus* (*C. acanthoides* Sm.).

3. Carduus pycnocephalus L., Sp. Pl. 1151. 1753.

Herbs, annual up to 1 m high. Stems simple or branched, white greyish tomentose above, winged; wings dentate, lobed, spiny. Basal leaves obovate; lobes rounded; cauline lanceolate or oblanceolate, lyrate-pinnatifid, decurrent at base ca 14 x 7 cm, sparsely hairy above, whitish tomentose beneath; lobes spinuous. Heads ca 1.5-2 cm across, cylindrical. Involucral bracts imbricate, hairy, 5-7-seriate. Receptacular bristles ca 1 cm long. Corolla ca 1.5 cm long, purple or white. Achenes ca 5 mm long. Pappus ca 1.5 cm long.

Fl. & Fr. Feb. - May.

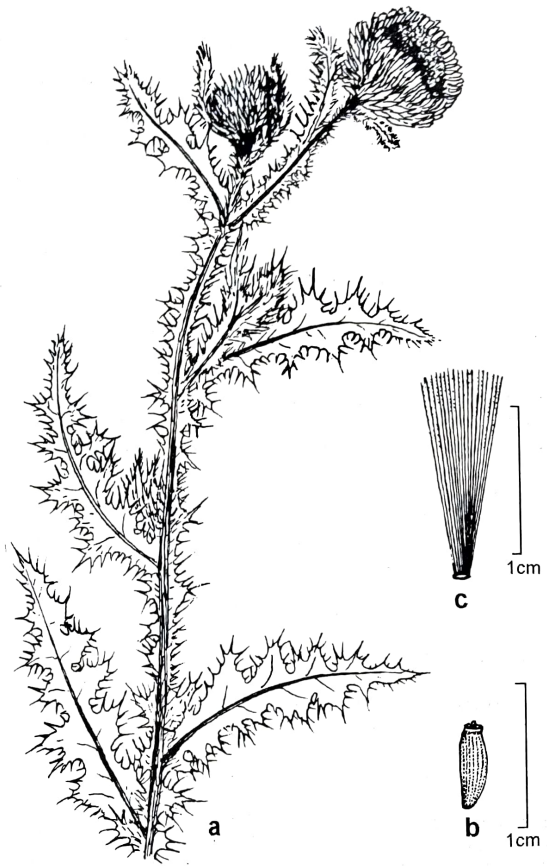

Fig. 47. Carduus edelbergii Rech.f. : a. Habit; b. Achene; c. Pappus.

Distrib. India: Jammu & Kashmir.

Afghanistan, Pakistan, Sri Lanka, Middle to S. Europe, and S.W. Asia.

4. Carduus tenuiflorus Curtis, Fl. Lond. 'Fasc'. 6: Pl. 55. 1790-98; Azad & Javeid in J. Bombay Nat. Hist. Soc. 75(1): 249. 1978.

Herbs, annual or biennial, ca 50 cm high, stems hairy, winged; wings up to ca 1 cm broad, spiny at tip. Leaves oblanceolate-lanceolate, sparsely hairy above, hairy beneath. Heads ca 1.5 cm across, cylindrical, sessile, in compact clusters of 4-8. Involucral bracts ovate-lanceolate, glabrous, smooth, with scarious margins. Corolla ca 1 cm long. Achenes ca 4 mm long, smooth. Pappus ca 1 cm long.

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas. Jammu & Kashmir.

Europe and China.

EXCLUDED SPECIES

Carduus kumaonensis (J. Ar.) Kazmi in Mitt. Bot. Staats. Munchen Band 5: 364. 1964. (Dec.). *C. crispus* subsp. *kumaonensis* J. Ar. in Mem. Mus. Nat. Hist. Nouv. ser. 24: 189. 1849.

Distrib. India: Jammu & Kashmir, Uttar Pradesh.

Note. There is no specimen available in Indian herbaria.

6. Carthamus L.

Annual, rarely perennial, usually spiny. Leaves alternate, entire or pinnatifid, spinescent. Heads usually homogamous, solitary, ovoid or subglobose. Involucral bracts in many rows, imbricate, spiny, outer leaf like; inner dry, entire or with a short, fimbriate appendage. Receptacle flat. Florets all hermaphordite. Corolla yellow, white or purplish; tube slender; limb oblong, dilated at base, 5-cleft. Filaments usually densely hairy; anther bases sagittate; auricles connate; tails short, fimbriate. Style arms short or long. Achenes obovoid, 4-angled or compressed, glabrous; outer without pappus, coarsely rugose; inner more or less smooth, usually with pappus.

In mediterranean region, Africa, Asia; ca 13 species, 3 in India.

Literature. HANELT, M.P. (1962). Monographische Ubersicht der Gattung Carthamus L. (Compositae) *Feddes Rep.* 67: 41-180. PATHAK, M. & T.B. SABNIS, (1935). A note on the classification of Indian safflower. *Indian J. Agric.* Sci. 5: 705-714.

KEY TO THE SPECIES

1a.	Basal and cauline leaves not divided	3. C. tinctorius
b.	Basal leaves usually pinnatifid or pinnatisect	2
2a.	Pappus absent	2. C. oxyacantha
b.	Pappus of narrow ciliate scales	1. C. lanatus

1. Carthamus lanatus L., Sp. Pl. 830. 1753; Hook.f., Fl. Brit. India 3: 386. 1881.

Annuals, erect, rigid, cobwebby cottony or glabrate, glandular, 15-45 cm high. Radical leaves lyrate-pinnatifid, spinose dentate; 7-14 cm long, hispid or scaberulous, cauline ovate, spinescent, 2.5-3.5 cm long, half-amplexicaul, strongly 3-nerved. Heads 2.5-3.5 cm across. Outer involucral bracts large, lanceolate, lanceolate, 2.5-5 cm long, spreading, lanceolate, leafy, spinescent; inner oblong-lanceolate to linear, entire, scarious. Receptacle bristles very long. Flowers pale yellow. Achenes pale yellowish or grey, ca 6 mm long, very hard, obtusely 4-angled. Pappus pale, silvery or bronze coloured narrowly sword shaped, ca 1 cm long, unequal.

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas, in waste lands, 1500-2300 m. Jammu & Kashmir and Uttar Pradesh.

Pakistan, W. Asia, Europe, and Westward to Atlantic.

Note. Seeds yield an oil and plant is used in France as sudorific, febrifuge and anthelmintic. (Chopra et al. 1956).

2. Carthamus oxyacantha M.Bieb. Fl. Taur. Cauc. 2: 283. 1808; Hook.f., Fl. Brit. India 3: 386. 1881.

Hindi: *Kantiari, Poli.*

Herb, puberulous, branched, 30-40 cm high; branches white. Leaves oblong or oblong-lanceolate, 1.5-4.5 cm long; lower shortly spinulose-toothed; upper half amplexicaul, spinous. Heads 1.5-2.5 cm across. Outer involucral bracts leafy, ca 2.5 cm long, spiny. Receptacle bristles long. Flowers orange yellow. Achenes obovoid, 4-angled, smooth, shining, truncate at top. Pappus absent.

Fl. & Fr. April - Sept.

Distrib. India: 300-1600 m. Jammu & Kashmir, Uttar Pradesh, Punjab, Haryana, Rajasthan and Madhya Pradesh.

Pakistan.

Note. Very common in cultivated fields after harvest. Oil extracted from seeds is used medicinally, for dressing bad ulcers and as remedy for itch. Seeds are sometimes eaten also.

3. Carthamus tinctorius L., Sp. Pl. 830. 1753; Hook.f., Fl. Brit. India 3: 386. 1881.

Eng.: *Safflower;* Hindi: *Kusum;* Tamil.: *Sendurkem;* Tel.: *Kusamba.*

Herbs, erect, glabrous, ca 45 cm high, thistle like. Leaves lanceolate, spinous toothed, 4-12 x 1-3 cm, stiff, sessile. Heads 1.2-2.5 cm across, discoid, terminal. Involucral bracts many, spinous, erect; outer ones leaflike; inner narrow. Receptacle flat, densely bristly. Flowers orange red. Corolla tube slender, deeply 5-lobed. Achenes 4-angled, glabrous.

Fl. & Fr. Feb. - April.

Distrib. India: Cultivated almost throughout India and sometimes found as an escape.

Note. The plant is cultivated for its valuable oil. It also yields a dye. Seeds are used in rheumatism, as purgative, diuretic, etc.

7. Centaurea L.

Herbs, usually rigid. Leaves alternate, entire, toothed or pinnatifid. Heads usually heterogamous, corymbose or panicled, solitary, ovoid or globose. Florets purple, violet, blue, white or yellow. Outer florets 1-seriate, neuter. Disc florets female, fertile; tube slender; limb straight or oblique, 5-fid to middle or lower. Involucral bracts many-seriate, imbricate, appressed, margins scarious or coriaceous or ending in a simple or palmately divided spine or pectinate appendage. Receptacle flat, densely bristly. Anther bases sagittate; auricles connate; tails long or short, entire or lacerate. Style arms with a thickened hairy basal ring. Achenes oblong or obovoid, compressed or obtusely 4-angled. Pappus many-seriate, various or absent.

Europe, N. Africa, N. China, America, Australia; ca 600 species, 6 in India.

Note. Mostly cultivated as an ornamental.

Literature. WAGENITZ, G. (1955). Pollen morphologie und systematik in der Gattung *Centaurea* L. *Flora* 142: 213-279.

KEY TO THE SPECIES

1a.	Branches white; outer involucral bracts ending in pectinate appendage	**1. C. bruguiseriana**
b.	Branches green; outer involucral bracts not ending in pectinate appendage	2
2a.	Involucral bracts not spiny	3
b.	Involucral bracts spiny	4
3a.	Involucral bracts cottony; pappus ca 4 mm long	**3. C. cyanus**
b.	Involucral bracts glabrous; pappus ca 7 mm long	**4. C. depressa**
4a.	Flowers yellow	**6. C. melitensis**
b.	Flowers usually purple	5
5a.	Young leaves lanate; involucre 6-8 mm in diam.	**2. C. calcitrapa**
b.	Young leaves green, hispidulous; involucre 9-14 mm in diam.	**5. C. iberica**

1. Centaurea bruguiseriana (DC.) Hand.-Mazz. in Ann. Nat. Hofmus. Wien. 27: 451. 1913. *Tetramorphaea bruguiseriana* DC., Prodr. 6: 604. 1838. *Centaurea phyllocephala* Boiss., Fl. Orient. 3: 684. 1875; Hook.f., Fl. Brit. India 3: 385. 1881.

Herbs, glabrous or hispid, branched; branches white wide spreading, cylindric. Lower leaves lanceolate, small, entire or pinnatifid, scabrid, spinulose toothed sessile; cauline amplexicual, cordate at base. Heads small, termianl. Outer involucral bracts ending in oblong pectinately ciliate leaves; inner white, entire, white, ending in long strong spine; innermost acuminate. Achenes minute, longer than paleaceous pappus.

Fl. & Fr. June - July.

Distrib. India: Punjab.

Pakistan, Afghanistan and Westwards to Asia minor.

Note. There is no specimen in India herbaria from Punjab.

2. Centaurea calcitrapa L., Sp. Pl. 917. 1753; Hook.f., Fl. Brit. India 3: 385. 1881.

Herbs, 25-80 cm high, erect or spreading, divaricately branched from base, cottony or glabrous. Basal leaves pinnatifid or pinnate, pubescent, spreading; lobes linear, acute, toothed; cauline sessile; uppermost lanceolate. Heads ca 7 mm across, surrounded by upper leaves, ovoid, lateral and terminal, sessile or peduncled. Involucral bracts ovate, with scarious margins, coriaceous, terminating in long spreading spine with short lateral ones at base. Florets pale purple, glandular, equal. Achenes white, ca 2 mm long. Pappus absent.

Fl. & Fr. June - Oct.

Distrib. India: ca 1800-2000 m. Jammu & Kashmir and Karnataka.

Europe, W. Asia and China.

Note. Introduced in most parts of the world.

3. Centaurea cyanus L., Sp. Pl. 911. 1753. *C. lanata* Roxb., Fl. Ind. 3: 644. 1832; Hook.f., Fl. Brit. India 3: 384. 1881.

Annuals or biennials, erect, 15-75 cm high, branched. Lower leaves lanceolate, entire or lyrate-pinnatifid, acute, petiolate; upper linear-lanceolate, entire. Heads ca 1 cm across, ovoid. Involucral bracts oblong, obtuse, cottony, tip broad with brown scarious toothed margins. Outer florets blue; inner bluish violet. Achenes grey, silky, ca 4 mm long. Pappus ca 4 mm long.

Fl. & Fr. March - June.

Distrib. India: Uttar Pradesh and Tamil Nadu.

Native of Mediterranean region and Europe.

Note. Usually cultivated; often met with as an escape in waste places and roadsides.

4. Centaurea depressa M.Bieb. Fl. Taur. Cauc. 2: 346. 1803; Hook.f., Fl. Brit. India 3: 385. 1881.

Annual, rarely biennial; stems 15-50 cm, branched or simple. Lower leaves oblong, usually entire, rarely pinnatifid, grey tomentose, short petiolate; upper linear-lanceolate, acute, entire or spinulose mucronulate. Heads ca 1.2 cm across, ovoid. Involucral bracts glabrous, margins scarious, white or brown, toothed; teeth white lanceolate. Outer florets dark blue, spreading; inner violet. Achenes shining, puberulous, equalling or shorter than the middle row of pappus hairs. Basal areole bearded. Pappus ca 7 mm long.

Fl. & Fr. Aug. - Sept.

Distrib. India: Jammu & Kashmir.

Pakistan, Afghanistan and Westwards to Asia minor.

5. Centaurea iberica Trev. ex Spreng., Syst. 3: 406. 1826; Hook.f., Fl. Brit. India 3: 385. 1881. **Fig. 48.**

Fig. 48. Centaurea iberica Trev. ex Spreng. : **a.** Habit; **b.** Achene.

Herbs, much branched; stems 15-50 cm or more, erect or spreading, divaricately branched. Lower leaves runcinate to lyrate-pinnatisect; lobes ovate to linear-lanceolate, hispidulous, denticulate at margins; upper lanceolate. Heads ca 1 cm across, ovoid, surrounded by upper leaves, subsessile. Involucral bracts with scarious margins; apical spines stout, sulcate, usually with 1-3 basal spines. Florets pruple, glandular. Achenes ca 3 mm long. Pappus ca 2 mm long.

Fl. & Fr. July - Aug.

Distrib. India: Common along the roadsides 300-2300 m. Jammu & Kashmir.

W. Asia, S.E. Europe and Pakistan.

6. Centaurea melitensis L., Sp. Pl. 912. 1753; Hook.f., Fl. Brit. India 3: 385. 1881.

Herbs, annual or biennial, 20-70 cm high, pubescent or glabrous; stems winged above, sparingly branched from middle. Lower leaves lanceolate, lyrate-pinnatifid to sinuately lobed; upper cauline leaves linear, decurrent. Heads ca 1 cm across, ovoid-globose, solitary or in groups of 2-3. Involucral bracts glabrous or puberulous, ending in a spreading and recurved spine, margins spinulose or with short lateral spines on each side. Florets yellow, glandular. Achenes ca 2 mm long, puberulous. Pappus ca 2 mm long.

Fl. & Fr. June - Sept.

Distrib. India: Tamil Nadu.

Westwards to Atlantic.

Note. Usually cultivated, sometimes found as an escape.

EXCLUDED SPECIES

Centaurea pulchra DC., Prodr. 6: 578. 1838.

The occurrence of this species in India is doubtful. Stewart (1972) in Nasir *et* Ali. Ann. Cat. Vas. Pl. W. Pakistan has given the distribution as Jammu & Kashmir. But there is no specimen in Indian herbaria.

8. Cirsium P. Mill.
(*Cnicus* L.)

Herbs with spinous leaves. Leaves decurrent at base or sessile. Heads many flowered. Involucral bracts imbricate, apex more or less spinous. Receptacle fimbriate.

Flowers purple or yellowish, equal, bisexual, rarely dioecious corolla equal; tube short, throat oblong; limb 5-fid or 5-partite. Filaments free, papillose or glabrous; anthers with tail-like appendages or not. Achenes oblong, compressed, glabrous. Pappus multiseriate, bristles plumose.

North temperate zone; ca 150 species, 7 in India.

Literature. KITAMURA, S. (1934). Les Cirses de l'Asie Orientale; leur Classification et leur distribution. *Acta Phytotax. Geobot.* 3: 1-14. (A critical treatment in Japanese). SCHTEPA, T.S. (1965). Materies at studium Pollinis Characterum generis *Cirsium* Mill. (en russe). *Not. Syst. Georg. Inst. Bot. Thbil.* 26: 57-62.

Note. Most of the species of this genus are extremely variable and Biosystematic study is required to draw correct delimitations of the species.

KEY TO THE SPECIES

1a.	Inner involucral bracts with dilated tips	**7. C. wallichii**
b.	Inner involucral bracts not dilated at tips	2
2a.	Heads usually ca 2.5 cm across	3
b.	Heads usually 3.5-7.5 cm across	4
3a.	Leaves always glabrous above; heads densely fascicled	**1. C. argyracanthum**
b.	Leaves ciliate smooth or scaberulous above; heads usually solitary	**5. C. shansiense**
4a.	Involucral bracts quite glabrous, none really spinescent, the points of the outermost being merely needle-like; pappus ca 2.5 cm long	**4. C. interpositum**
b.	Involucral bracts not quite glabrous, ending usually in spines; pappus ca 1.5 cm long	5
5a.	Corolla usually ca 6 cm long	**2. C. eriophoroides**
b.	Corolla usually ca 2.5 cm long	6
6a.	Heads densely woolly, subsolitary, drooping	**3. C. falconeri**
b.	Heads not densley woolly, usually glabrate, solitary or fascicled, inclined	**6. C. verutum**

1. Cirsium argyracanthum DC., Prodr. 6: 640. 1838. *Cnicus argyracanthus* (DC.) C.B. Clarke, Comp. Ind. 218. 1876; *C. wallichii* DC. var. *wightii* Hook.f., Fl. Brit. India 3: 364. 1881.

Herbs, robust, 90-180 cm tall, branched. Radical leaves irregularly pinnately lobed, 25-60 x 2.5-3.7 cm, nearly glabrous on both surfaces, densely spiny at margins, stalked; cauline leaves shorter, sessile. Heads globose, many, usually crowded in terminal clusters 1.8-2.5 cm across, sessile or stalked. Outer involucral bracts ending in long, rigid spines; innermost linear, long pointed. Flowers pale yellow or white. Achenes ca 3 mm long. Pappus nearly white, 1.2 cm long, nearly white.

Fl. & Fr. July - Sept.

Distrib. India: Temperate Himalayas, 2000-3000 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal, Bhutan and Pakistan.

Note. A very variable species.

2. Cirsium eriophoroides (Hook.f.) Petrak in Bail. Bot. 78: 9. 1912. *Cnicus eriophoroides* Hook.f., Fl. Brit. India 3: 363. 1881.

Herbs, tall, stout; stems sparsely villous or cottony. Radical leaves pinnatifid, lobes broad, lobulate, petioled; cauline broad, ovate or ovate-lanceolate, sinuate-lobed, membranous, glabrous, cobwebby or setulose above, cottony or glabrate beneath. Heads solitary or clustered, 5.0-7.5 cm across, densely woolly. Involucral bracts lanceolate, ending in soft long spines; inner numerous, linear acuminate. Corolla ca 6.2 cm long. Achenes obovoid-oblong ca 5 mm long. Pappus brown ca 1.5 cm long.

Fl. & Fr. Aug. - Sept.

Distrib. India: E. Himalayas, Sikkim.

China.

3. Cirsium falconeri (Hook.f.) Petrak in Feddes, Repert. 9: 198. 1911. *Cnicus falconeri* Hook.f., Fl. Brit. Ind. 3: 363. 1881. *Cirsium verutum* [*auct. non* (D. Don) Spreng.] Kitam. in Fl. E. Himal: 330. 1966. *C. involucratum (auct. non* DC.) Kitam. in F. & Fl. Nepal Himal. 250. 1955 *Cnicus involucratus* [*auct. non* (DC.)] Hook.f., Fl. Brit. India 3: 362. 1881.

Herbs, very stout, tall, villous. Leaves membranous, setose and spinescent above, appressed cottony beneath; teeth and lobes spinescent; cauline large, broad, ovate or ovate-lanceolate, sinuate-lobed or subpinnatidid. Heads 6-7.5 cm across, globose, subsolitary drooping, densely woolly. Involucral bracts lanceolate, all ending in a long slender, flexuous spine. Corolla 2.5 cm long. Achenes ca 5 mm long. Pappus ca 1.5 cm long.

Fl. & Fr. June - Oct.

Distrib. India: Himalayas, 3000-4500 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal, Bhutan, Myanmar and S. Tibet.

Note. Kitamura & Gould [in Hara (ed.) *Enum. Fl. Pl.* Nepal 3: 146. 1982] observe "Cirsium falconeri as recognised here is a very variable species. Plants from Kashmir have leaves which are strongly spinescent above, tomentose beneath, with lobes

terminating in spines 1.5-2.5 cm long. The involucres are woolly and densely covered in long yellow spines. Plants from the eastern Himalayas have leaves which are often sparsely spinescent above and with shorter spines on the lobes. Tomentum is sometimes absent from leaves and involucres, and involucral spines vary in length and density. The amount of variation suggests that several species may be involved and further study is required".

4. Cirsium interpositum Petrak in Feddes, Rep. 43: 283. 1838. *Cnicus griffithii* Hook.f., Fl. Brit. India 3: 363. 1881. *Cirisium lepskyi* Petrak in Feddes, Repert. 9: 197. 1911.

Khasi: *Soh-chila;* Nep.: *Sumori-kaura.*

Herbs, robust; stems cottony. Cauline leaves pinnatifid; lobes lanceolate, acute, spinescent, setulose above, white appressed tomentose beneath. Heads crowded, ca 5 cm across, glabrous. Outermost involucral bracts short with acicular points; the rest linear, wavy, aristate or acuminate, quite glabrous. Corolla ca 3 cm long. Achenes 5 mm long. Pappus ca 2.5 cm long.

Fl. & Fr. June - Sept.

Distrib. India: 1800 m. Arunachal Pradesh and Manipur.

Tender shoots and the aromatic seeds are eaten.

5. Cirsium shansiense Petrak in Mitt. Thuring. Bot. Ver. n.f. 1: 176. 1943. *Cnicus sinensis* (chinense) (Gard. et Champ.) C.B. Clarke, Comp. Ind. 219. 1876; Hook.f., Fl. Brit. India 3: 364. 1881.

Herbs, 1-2 m tall, stiff, glabrous or slightly pubescent, fastigiately branched above; branches slender, erect. Leaves many, linear oblong or lanceolate, 5-12.5 cm long, narrow, sinuate lobed; lobes bearing 2-3 spines spinulose at sinus, ciliate and spinescent, smooth or scaberulous above, of smaller leaves recurved at margins, sessile. Heads solitary, ca 2.5 cm across, glabrous or cottony. Involucral bracts very numerous, appressed; outer oblong, obtuse or tips spinulose; inner linear with inflexed, acute tips. Corolla purple ca 1.6 cm long. Achenes ca 4 mm long. Pappus ca 8 mm long.

Fl. & Fr. June - Aug.

Distrib. India: Meghalaya.

Myanmar and China.

6. Cirsium verutum (D. Don) Spreng., Syst. Veg. 3: 370. 1826. *Cnicus verutus* D. Don, Prodr. Fl. Nepal. 167. 1825. *Cirsium involucratum* ex DC., Prodr. 6: 639. 1838. *C. involucratum* DC. var. *horridum* (Hook.f.) Balakr., Fl. Jowai 1: 256. 1981. *Cnicus involucratus* (DC.) Hook.f. var. *horrida* Hook.f., Fl. Brit. India 3: 362. 1881.

Herbs, erect, 0.3-1.8 m tall, stout, branched above. Radical leaves pinnatifid to middle or deeper, ca 30 cm long setulose above, white tomentose beneath, teeth and lobes spinescent; cauline broader, ovate or lanceolate, cordate-amplexicaul, pinnatifid. Heads solitary or fascicled, 3.5-6.0 cm across, inclined, involucrate. Involucral bracts glabrate, ending in slender, erect or subrecurved spines, or a few innermost linear acuminate. Corolla ca 2.5 cm long, glabrous. Achenes, obovoid-oblong, ca 5 mm long. Pappus brown ca 1.5 cm long.

Fl. & Fr. Aug. - Dec.

Distrib. India: Himalayas, in pine forests, open wastelands and grasslands, 1200-4000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim and Meghalaya.

Note. Hook.f. (1881) described the variety *horrida* on the basis of densely setulose and strong spines on leaves.

7. Cirsium wallichii DC., Prodr. 6: 643. 1838. *Cnicus arachnoideus* Wallich, Cat. 99. n. 2891. 1831 (nom. nud.). *C. cernuus* Wallich, Cat. 99 n. 2892. 1831. (nom. nud.). *Cirsium nepalensis* DC., Prodr 6: 642. 1838. *Cnicus argyracanthus* var. *nepalensis* (DC.) C.B. Clarke, Comp. Ind. 218. 1876. *Cnicus wallichiii* (DC.) C.B. Clarke Comp. Ind. 219. 1876. *C. wallichii* var. *nepalensis* (DC.) Hook.f., Fl. Brit. India 3: 364. 1881. *C. wallichii* var. *cernua* Hook.f., Fl. Brit. India 3: 364. 1881. *C. wallichii* var. *fasciculata* Hook.f., Fl.Brit. India 3: 364. 1881. *C. wallichii* var. *platylepis* Hook.f., Fl. Brit. India. 3: 364. 1881.

Herbs with spreading branches, 1-3.5 m tall, pubescent. Leaves sinuate pinnatifid; lobes spinescent, lobulate, spines very long and strong, glabrous or cottony or tomentose beneath, sessile. Heads 1.8-3.8 cm across, solitary, on naked, peduncled or sessile, fascicled, involucrate. Outer involucral bracts lanceolate, ending in spreading erect or recurved spines; inner with spreading or recurved, more or less dilated, lanceolate or ovate, scarious serrulate, acute or spinescent tips. Corolla ca 1.6 cm long, white, yellow or red.

KEY TO THE VARIETIES

1a. Leaves usually cottony or tomentose beneath — **7.2. var. wallichii**
b. Leaves usually quite or nearly glabrous beneath — **7.1. var. glabratum**

7.1. var. **glabratum** (Hook.f.) Wendelbo in Nytt Mag. B. 1: 67. 1952. *Cnicus wallichiii* DC. var. *glabrata* Hook.f., Fl. Brit. India. 3: 364. 1881.

Fl. & Fr. June - Sept.

Distrib. India: Himalayas, 1200-3500 m. Jammu & Kashmir.

Afghanistan, China and Nepal.

Note. Extremely variable species with as many as six varieties (Hook.f. 1881). However, the main distinguishing characters of some varieties being the spiny nature of the plants and density of tomentum on leaves, both these traits are influenced by the habitats in which they grow. Further no types could be procured for critical studies of these varieties. Under these circumstances some of the varities are merged.

7.2. var. **wallichii** **Fig. 49.**

Fl. & Fr. June - Sept.

Distrib. India: Himalayas, up to ca 2200 m. Jammu & Kashmir, Himachal Pradesh and Sikkim,

Nepal and Bhutan.

EXCLUDED SPECIES

Cirsium tibeticum Kitam. in Acta Phyt. Geobot. 15: 43.f.5.1953.

Distrib. India: Himalayas. Sikkim.

Nepal, Bhutan and Tibet.

Note. There is no specimen in Indian Herbaria.

9. Cousinia Cass.

Herbs, thistle-like. Leaves alternate, toothed, lobed or pinnatisect, spinescent. Heads homogamous, globose, ovoid or oblong, solitary or crowded, rarely corymbose. Flowers white or purple, all similar, usually bisexual, tubular; limb cylindric, slender, usually unequal, 5-fid. Involucral bracts many-seriate, appressed with long, erect, spreading or recurved, spinous tips; inner erect, slender, scarious. Receptacle flat, densely bristly. Filaments glabrous; anther bases sagittate; auricles connate; tails branched or villous. Style arms narrow, short or long. Achenes, usually obovate or oblong, compressed, glabrous, 5-many ribbed. Pappus hairs 1-seriate, slender or flattened, simple, free, caducous, rarely absent.

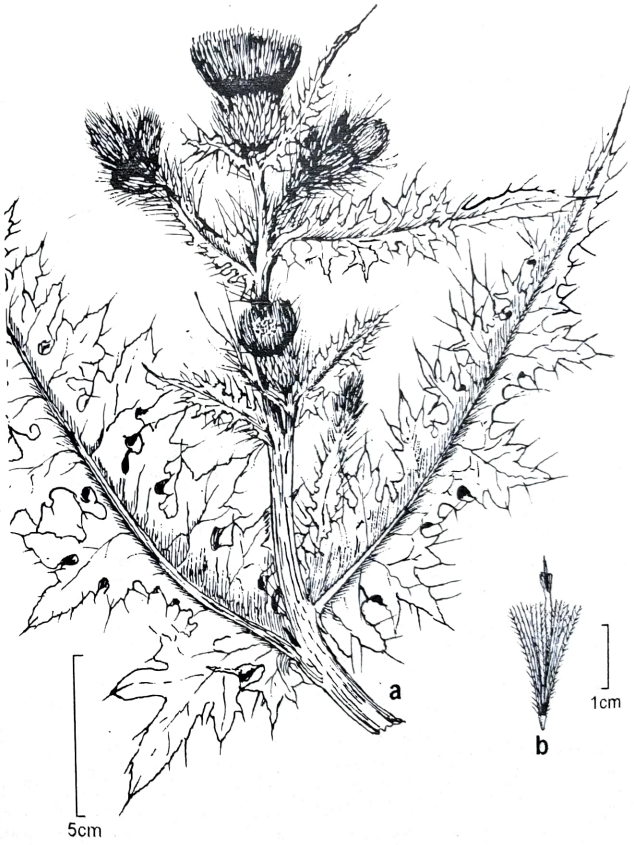

Fig. 49. Cirsium wallichii DC. var. wallichii : a. Habit; b. Floret.

E. Mediterranean to C. Asia; ca 400 species, 5 in India.

Literature. RECHINGER, K.H. (1972) Flora Iranica 90 (1,5): 1-329. SCHTEPA, I.S. (1962). Palynological data for the Systematics of the genus *Cousinia* Cass. *Pollen* et *Spores* 4(2):375.

KEY TO THE SPECIES

1a.	Bristles of receptacle quite smooth	**4. C. prolifera**
b.	Bristles of receptacle more or less rough	2
2a.	Pappus present, scabrid	3
b.	Pappus absent or very short	4
3a.	Heads fascicled; involucral bracts straight	**2. C. falconeri**
b.	Heads not fascicled; involucral bracts spreading or recurved	**5. C. thomsonii**
4a.	Branches spinous winged	**3. C. microcarpa**
b.	Branches not winged	**1. C. auriculata**

1. Cousinia auriculata Boiss., Fl. Diagn. Ser. 2, 3: 58. 1856; Hook.f., Fl. Brit. India 3: 360. 1881.

Herbs, perennial, corymbosely branched, 10-30 cm high; stems cottony. Radical leaves oblong-ovate, obtuse, serrulate at margins; cauline ovate or ovate-lanceolate, sinuate or pinnatifid, tip and lobes strongly spinescent. Heads solitary, 2.5-5.0 cm across, peduncled. Involucral bracts 1.8-3.8 cm long; spines very long, stout, spreading and recurved, keeled, deeply channelled above; inner narrowly oblanceolate, aristate, scarious, erect, shining, serrulate above at margins. Receptacular bristles slender, scabrid above, twisted below.

Fl. & Fr. June - Aug.

Distrib. India: W. Himalayas. Jammu & Kashmir.

Afghanistan and Pakistan.

2. Cousinia falconeri Hook.f., Fl. Brit. India 3: 360. 1881.

Herbs, stout, erect, cottony, branched. Basal leaves pinnatifid or half-pinnatifid, cobwebby above, densely white tomentose beneath; segments horizontal, triangular or lanceolate, simple or lobulate, spinescent at tip and lobes. Heads solitary or fascicled, 1.2-6.2 cm across, sessile or subsessile. Involucral bracts numerous, subulate-lanceolate, 2.5-3.5 cm long, woolly, spiny; inner linear, aristate, scarious, shining. Receptacular hairs scabrid above.

Fl. & Fr. June - Aug.

Distrib. India: W. Himalayas, ca 3600 m. Jammu & Kashmir.

3. Cousinia microcarpa Boiss., Diagn. Pl. Or. Ser. 2, 3: 59. 1856; Hook.f., Fl. Brit. India 3: 360. 1881.

Herbs, biennial, slender, 15-50 cm high; stems dichotomously, corymbosely branched; branches spinuous winged. Radical leaves runcinate or lyrate runcinate-pinnatifid, glabrate above, cottony beneath; segments toothed; cauline linear-oblong, irregularly pinnatifid and toothed sessile; lobes and teeth spinescent. Heads globose, ca 2.5 cm across, peduncled. Involucral bracts triangular-lanceolate, ca 1.2 cm long, cobwebby, ending in very stout, spreading, flat, keeled spines; innermost narrowly spathulate, scarious, shining, apiculate, serrate above. Receptacular bristles scabrid. Corolla purple, ca 1.5 cm long. Achenes oblong-ovate, ca 3 mm long. Pappus absent.

Fl. & Fr. June - Aug.

Distrib. India: Jammu & Kashmir.

Afghanistan and Persia.

4. Cousinia prolifera Jaub. & Spach., Ill. Pl. Or. 2: 75. t. 157. 1845. *C. minuta* Boiss., Diagn. Ser. 1, 6: 119. 1845; Hook.f., Fl. Brit. India 3: 359. 1881.

Annuals, small, rigid with spreading or decumbent, dichotomous branches. Basal leaves oblong or lanceolate, sinuate-pinnatifid, 8-10 x 2-4 cm, membranous, hoary, cobwebby on both surfaces, sessile. Heads globose, many ca 2 cm across, terminal and in forks. Involucral bracts 15-20, triangular-lanceolate, stout, stellately spreading, recurved. Receptacular bristles smooth. Flowers yellow, ca 7 mm long. Achenes obovoid, compressed, 5-7-angled, ca 2 mm long, truncate with a crenulate ring; angles subcrenate. Pappus deciduous; hairs scabrid.

Fl. & Fr. June - Aug.

Distrib. India: Jammu & Kashmir and Rajasthan.

Afghanistan, Pakistan, Iran and C. Asia.

5. Cousinia thomsonii C.B. Clarke, Comp. Ind. 213. 1876; Hook.f., Fl. Brit. India 3: 360. 1881. **Fig. 50.**

Herbs, perennial, ca 30 cm high, stout, erect, cottony, branched. Radical leaves deeply interruptedly pinnatifid, 12.5-25.0 x 1.8-3.0 cm, cobwebby above, densely white tomentose beneath; segments horizontal, triangular, with a stout nerve and long spine, sometimes forked or 3-sect at base; lobes divaricating; midrib stout, glossy; cauline ovate-lanceolate, with spiny tips and lobes, sessile or auricled. Heads 2.5-5.0 cm across,

Fig. 50. Cousinia thomsonii C.B. Clarke : a. & b. (a. Portion of a plant; b. Portion of a plant with inflorescence); c. Involucral bracts. d. Floret.

peduncled, suberect or nodding. Involucral bracts many triangular-lanceolate, 1.0-3.5 cm long, woolly, spiny at tip; outer recurved. Receptacular bristles ca 1.5 cm long, scabrid above. Corolla purplish, glabrous, 1.2-1.6 cm long. Achenes obovoid, glabrous. Pappus scabrid.

Fl. & Fr. June - Sept.

Distrib. India: W. Himalayas, 3000-4200 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Afghanistan, Pakistan and Nepal.

10. Crupina (Pers.) DC.

Herbs, annual, erect, corymbosely branched above. Leaves alternate; basal simple; cauline pinnatisect. Heads heterogamous. Involucral bracts imbricate, oblong-lanceolate, acute. Receptacular scales linear-subulate. Ray florets sterile. Disk florets hermaphrodite. Filaments glabrous. Achenes obovate, distally more villous; outer epappose; inner with 2 rows of pappus hairs.

S. Europe to Iran; 4 species, 1 in India.

Crupina vulgaris Cass., Dict. Sc. Nat. 12: 68. 1818; Kaul in Bull. Bot. Surv. India 18: 224. 1976.

Herbs, 50-80 cm high; stems slender, branched, narrowly grooved. Leaves pinnately cut into linear segments, sessile. Heads in apical, branched, leafless cymes, narrowly cylindrical, upto 3 cm long. Involucral bracts many-seriate; outermost 0.4-1.7 cm long, fine tipped, papery; middle distinctly veined. Stamens syngenesious forming a tube round the style. Achenes deep brown, 3-4 mm long. Pappus hairs brown, equalling or exceeding the achenes.

Fl. & Fr. May - July.

Distrib. India: Jammu & Kashmir and Gujarat.

Europe.

11. Echinops L.

Herbs, with white tomentum, thistle-like. Leaves alternate, pinnatifid, spinous. Heads blue or white, globose, sessile or short peduncled, 1-flowered. Flowers bisexual, all fertile; tube slender; limb with 5, slender segments. Involucral bracts many-seriate, rigid,

pungent; innermost lanceolate or linear, sometimes all connate into a tube with one rigid spine on outer side. Receptacle minute. Filamets glabrous; anther bases sagittate; auricles connate; tails short, entire or fimbriate. Style arms thick, with a thick basal ring. Achenes usually villous. Pappus crown of many short, free or connate bristles.

Europe, Africa, Asia; ca 100 species, 3 in India.

Note. Several species of *Echinops* are cultivated and are known as "Globe Thistles".

Literature. BUNGE, A. (1863). Ueber die Gattung *Echinops*. *Bull. Acad. St. Peterb.* 6: 390-412.

KEY TO THE SPECIES

1a. Heads usually 2.5-3.5 cm across **2. E. echinatus**
b. Heads usually 6-7.5 cm across 2
2a. Leaves very narrow, much divided; lobes narrow; inner involucral bracts ca 2.5 cm long when mature; outer involucral bracts few **3. E. niveus**
b. Leaves ovate-oblong, broad; lobes broad; inner involucral bracts ca 1.6 cm long when mature; outer involucral bracts numerous **1. E. cornigerus**

1. Echinops cornigerus DC., Prodr. 6: 525. 1838; Hook.f., Fl. Brit. India 3: 358. 1881. **Fig. 51.**

Annuals, erect, simple, stout; stems very leafy. Leaves ovate-oblong or oblong, pinnatifid or pinnate, 10-20 cm long, cobwebby above, densely cottony beneath; segments deeply lobulate; lobules spinescent. Heads ca 6-7.5 cm across with or without projecting spines; peduncles stout. Outer involucral bracts narrowly oblanceolate, glabrous, surrounded by ca 2.5 cm long bristles; inner connate, ca 1.6 cm long when mature. Achenes narrowly obconic, ca 8 mm long, villous.

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas, on open shady slopes, 2400-3300 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Pakistan, Nepal and Afghanistan.

2. Echinops echinatus Roxb., Fl. Ind. 3: 447. 1832; Hook.f., Fl. Brit. India 3: 358. 1881.

Hindi: *Utakanta, Gokru;* Mar.: *Utanti;* Sans.: *Kantalu, Utati.*

Annuals, 30-60 cm high, branched from base; branches wide spreading. Leaves oblong, pinnatifid, 7.5-20 cm long sessile; lobes triangular or oblong, sinuate, spinescent,

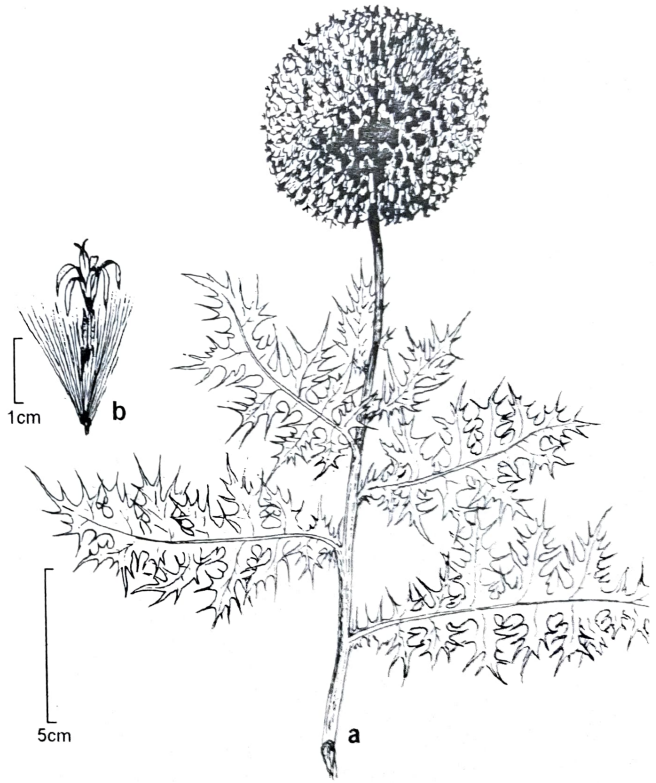

Fig. 51. Echinops cornigerus DC. : **a.** Habit; **b.** Floret.

spines often ca 4 cm long. Heads white 2.5-3.5 cm across, with many stout spines; spines 1.5-3.5 cm long. Involucre surrounded by strong, white bristles; outer involucral bracts 6-8, oblanceolate, glabrous; inner ca 8 mm long. Achenes obconic, ca 4 mm long, silky villous.

Fl. & Fr. March - Sept.

Distrib. India: Almost throughout, ascending to ca 1600 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Rajasthan, Bihar, W. Bengal, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Karnataka and Maharashtra.

Afghanistan, Pakistan and Myanmar.

Note. Common weed of open waste places and cultivated fields. Plants are used in hoarse cough and hysteria; powdered roots mixed with acacia gum, is applied to kill hair lice.

3. Echinops niveus Wallich ex DC., Prodr. 6. 526. 1838; Hook.f. Fl. Brit. India 3: 359. 1881.

Hindi: *Brham Danda.*

Herbs, erect; stems simple or branched; branches densely cottony. Leaves bipinnatifid, 7.5-20.5 cm long, densely cottony beneath; segments narrow with long spines, revolute. spinulose at margins. Heads 3.5-7.5 cm across; spines usually included. Outer involucral bracts oblanceolate, spinescent; inner connate, ca 2.5 cm long. Achenes ca 3 mm long, hairy, crowded with pappus. Pappus ca 1 cm long.

Fl. & Fr. Sept. - Feb.

Distrib. India: W. Himalayas, on open dry sunny slopes, 1300-2800 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

12. Goniocaulon Cass.

Annual, erect, glabrous, branched; stems 4-8-angled. Leaves alternate, narrow, toothed. Heads homogamous, oblong, fascicled, corymbose. Flowers all bisexual, fertile, similar tube slender; limb longer, cylindric, 5-fid almost to middle. Involucral bracts pale, many-seriate, narrow, rigid, acute, erect, not spinescent; outer gradually shorter. Receptacle very narrow, paleaceous. Filaments hairy; anther bases sagittate, connate; tails short. Style arms filiform. Achenes oblong, many-ribbed, glabrous. Pappus scales many-seriate, very unequal.

Indo Malayan; One species.

Goniocaulon glabrum Cass. in Bull. Soc. Philom. 34. 1817. *G. indicum* C.B. Clarke, Comp. Ind. 236. 1876. *Amberboa indica* DC., Prodr. 6: 558. 1838; Hook.f., Fl. Brit. India 3: 377. 1881.

Herbs, 30-90 cm high, erect; branches ribbed, simple below, corymbose above. Leaves linear-obovate or subspathulate, toothed at margins, narrowed at base, 5-10 cm long, halfamplexicaul, sessile. Heads narrow, fascicled in compound corymbs, 1.2-1.6 cm across, pedicelled. Corolla rose-purple, ca 5 mm long.

Fl. & Fr. Jan. - March.

Distrib. India: Uttar Pradesh, Bihar, W. Bengal, Madhya Pradesh and Maharashtra.

Note. Ocasionally found in cultivated lands, often gregarious on black soil.

13. Hemistepta Bunge ex Fischer et Mey

Herbs, tall, leafy, simple below, corymbosely branched above. Basal leaves lyrate-pinnatifid. Heads in large open panicled corymbs, long peduncled. Involucral bracts glabrate, many-seriate. Receptacle densely bristly, flat or convex. Filaments free, glabrous; anther bases sagittate. Style arms linear. Achenes smooth. Pappus hairs 1-2-seriate; inner feathery.

China, Japan, Nepal and Bangladesh; One in India.

Hemistepta lyrata Bunge ex Fischer et Mey. in Index Sem. Hort. Bot. Petrop. 2: 38. 1835. *Saussurea affinis* Spreng. ex DC., Prodr. 6: 540. 1838; Hook.f., Fl. Brit. India 3: 373. 1881.

Herbs, upto 2.5 m tall. Basal leaves lyrate-pinnatifid, 10-20 cm, glabrous or puberulous above, cottony beneath, petioled; cauline sinuate lobed or entire, sessile. Heads in large panicled corymbs, ca 1-2.5 cm across, long peduncled; peduncles 5-11 cm long. Involucral bracts glabrate; outer ovate, obtuse or acute; inner lanceolate, acuminate, pale, rarely cottony. Corolla pale red, very slender, ca 8 mm long. Anther tails short, fimbriate. Receptacle bristles long. Achenes obovoid, ca 2 mm long, smooth, 10-ribbed, tip contracted. Pappus hairs white, ca 3 mm long, very slender; outer pappus absent.

Fl. & Fr. Feb. - May.

Distrib. India: Arunachal Pradesh, Assam, Manipur, Uttar Pradesh, W. Bengal and Bihar.

Nepal, Myanmar, Bangladesh, China, Japan and E. Australia.

14. Jurinea Cass.

Herbs, annual or perennial. Leaves entire, toothed, or pinnatifid, rarely armed, more or less tomentose. Heads homogamous. Flowers purple, all bisexual; tube slender; limb elongate, 5-fid to middle or lower. Involucral bracts many-seriate, imbricate; outer shorter; innermost narrow, erect. Receptacle flat, densely bristly. Filaments free, glabrous; anther bases sagittate; auricles usually connate; tails elongate. Style arms short. Achenes 4-5-angled, glabrous, smooth or 1-3-ribbed. Pappus hairs many-seriate, simple, barbellate or feathery.

C. Europe, Mediterranean region to China, C. Asia; ca 100 species, 2 in India.

Literature. ILJIN, M.M. (1925). Revision of Turkistan species of the genus *Jurinea* Cass. *Trans. Sci. Soc. Turkest.* 2: 1-28. Pl. 1-10. (In Russian).

Note. Some of the species of *Jurinea* have been treated under *Dolomiaea* DC. and *Diplazoptilon* Liang. As the author could not examine the type/authentic material of these genera the species treated under *Dolomiaea* and *Diplazoptilon* by different authors are treated here under *Jurinea* only.

KEY TO THE SPECIES

1a. Leaves cottony above; pappus brown — **2. J. dolomiaea**
b. Leaves scabrid above; pappus whitish — **1. J. cooperi**

1. Jurinea cooperi Anthony in Notes Roy. Bot. Gard. Edinb. 18: 21. 1933.

Herbs, perennial, stemless; roots long, woody, branched. Radical leaves rosulate, lanceolate or oblanceolate, runcinate-pinnatifid, 9-15 x 4-7 cm; lobes, irregular, denticulate, shortly mucronate, upper surface green, scabrid, white tomentose beneath; petiole 1-3 cm long hispid. Heads many (4-10), sessile, crowded ca 2 cm across. Involucral bracts ca 5-seriate, margins of upper halves hispid; outer lanceolate, acute, 1-2 cm long, 4 mm broad; inner narrowly lanceolate, ca 2 cm long, 2 mm broad, obtuse. Receptacular bristles subulate, 3-5 mm long. Florets purple, ca 2 cm long; corolla tube 1.5 cm long; limb 5 mm long. Achenes (immature) quadrangular, ca 4 mm long. Pappus multiseriate, almost plumose, white, ca 2 cm long.

Fl. & Fr. Aug. - Sept.

Distrib. India: E. Himalayas, ca 4,3000 m, amongst rocky boulders. Sikkim.

China and Tibet.

Note. Some authors treat this species as *Diplazoptilon cooperi* (Anth.) Shih.

2. Jurinea dolomiaea Boiss., Fl. Or. Suppl. 311. 1888. *Carduus macrocephalus* Wallich, Cat. 100 n. 2904. 1831 (nom. nud.). *Dolomiaea macrocephala* Royle, Ill. Bot. Himal. 251. t. 57. 1835. *Jurinea macrocephala* (Royle) C.B. Clarke, Comp. Ind. 237. 1876, (non DC.); Hook.f., Fl. Brit. India 3: 378. 1881. **Fig. 52.**

Stemless perennials; root woody. Leaves oblong-lanceolate, pinnate or pinnatifid, 15-45 x 3.5-17.5 cm, cottony or cobwebby above, thickly white tomentose beneath; lobes broad, lobulate or pinnatifid, denticulate; teeth acute or mucronate. Heads many (3-30), 1.5-2.5 cm across, sessile or short peduncled; peduncles stout, tomentose, often cottony at base. Involucral bracts 1.8-3.5 cm long; outer ovate-lanceolate; inner elliptic-lanceolate, long acuminate, scabrid or smooth, erect, scarious. Receptacular bristles united into laciniate cup, bristles much shorter than achenes. Corolla 2.5-3 cm long. Anther tails lacerate. Achenes cuneate-obovate, ca 6-8 mm long, curved, compressed, unequally 4-5-angled, truncate, tubercled. Pappus brown, ca 2.5 cm long, copious, brown, cohering at base.

Fl. & Fr. June - Sept.

Distrib. India: W. Himalayas, Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal and China.

Note. According to Hara *et al.* (1982) *J. macrocephala* DC., Prodr. 6: 674. 1838 is based on a plant from Iran. The style branches of *J. dolomiaea* are long. Some authors treat this species as *Dolomiaea macrocephala* DC. Aswal & Goel (*Indian J. For.* 11(4): 339. 1988) have proposed a transfer of this species under *Jurinella macrocephala* (Royle) Aswal et Goel.

EXCLUDED SPECIES

Jurinea gnaphalioides Klatt. in Sitzungshb. Munch. Akad. 96. 1878.

Jurinea himalaica Stewart in Nasir et Ali, Ann. Cat. Vas. Pl. W. Pak. 757. 1972.

Jurinea modesta Boiss., Diagn. Ser. 2, 3: 50. 1856.

Jurinea rosulata Klatt. in Sitzungsb. Munch. Akad. 96. 1878.

There are no specimens available in Indian herbaria, for the above mentioned species.

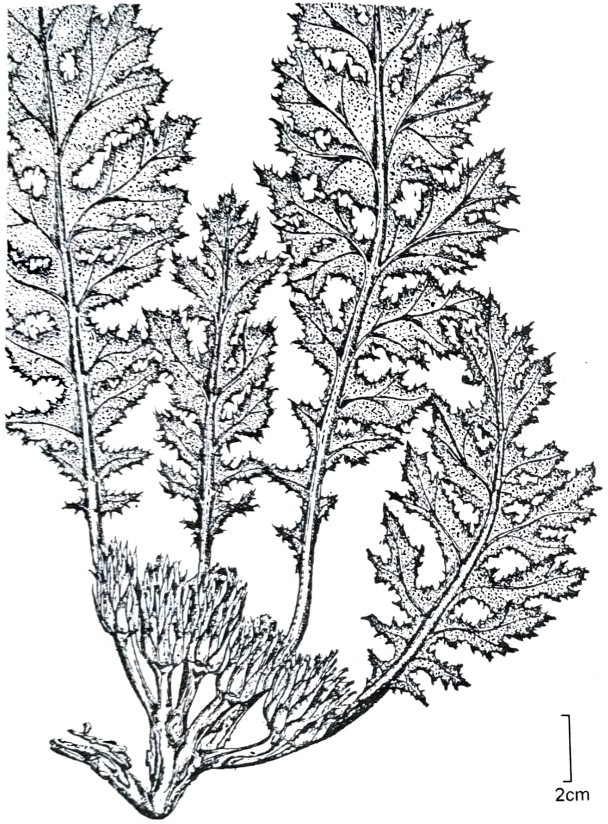

Fig. 52. Jurinea dolomiaea Boiss.: a. Habit.

15. Olgaea Iljin.

Herbs, robust. Leaves alternate, often decurrent, pinnatifid, spinescent. Heads homogamous solitary or crowded. Flowers all bisexual and usually fertile. Involucre ovoid-hemispheric or globose; bracts many-seriate, appressed. Receptacle flat or convex, densely bristly. Anther bases sagittate; tails slender. Style arms short. Achenes glabrous. Pappus copious, many-seriate.

C. Asia; ca 18 species, 1 in India.

Olgaea thomsonii (Hook.f.) Iljin in Not. Syst. Herb. Hort. Petrop. 2: 142. 1922. *Carduus thomsonii* Hook.f., Fl. Brit. India 3: 361. 1881.

Herbs, robust, 30-45 cm high; stems simple, strongly ribbed. Leaves linear-oblong or lanceolate, subpinnatifidly lobed, 15-20 cm long, strongly spinous, very coriaceous, shining, broadly auricled at base. Heads few, fascicled or subcorymbose, 7-7.5 cm across, inclined, densely woolly. Involucral bracts ca 2.5 cm long, with long, strong, spreading or recurved spine. Receptacular bristles very dense, ca 6 mm long. Corolla very slender, ca 3 cm long, glabrous. Filaments quite glabrous; anther bases very long, laciniate. Achenes ca 6 mm long, glabrous. Pappus hairs up to 3 cm long, stiff, very unequal.

Fl. & Fr. June - Sept.

Distrib. India: W. Himalayas, 2800-4000 m. Jammu & Kashmir.

Endemic.

16. Onopordum L.

Herbs, stout; stems often spinose winged. Leaves spinose-dentate, pinnatifid-pinnatisect, rarely subentire. Heads globose-ovoid. Involucral bracts many-seriate, spinescent. Receptacle with deep pits having dentate margins. Florets pink or reddish purple or white. Anthers with subulate, apical appendages; filaments pilose. Achenes elliptic, compressed or subtetragonal, glabrous. Pappus hairs many-seriate, scabrid or plumose, united into a ring at base.

Europe, N. Africa. W. Asia; ca 40 species, 1 in India.

Onopordum acanthium L., Sp. Pl. 827. 1753; Rau & Rao in Bull. Bot. Surv. India 2: 425. 1960.

Eng.: *Cotton thistle, Scotch thistle.*

Herbs upto 3 m tall; stems striate, winged; wings triangular, floccose, spiny; spines yellow tipped. Leaves oblong-ovate, broadly lanceolate or ovate, sinuate-dentate or with broadly triangular teeth ending in spine, 30 x 25 cm, greenish green and sparsely lanate above. Heads solitary or upto 3. Involucral bracts spinescent, antrorsely scabrid on the margins. Achenes elliptic, subcompressed, variegated, transversely rugose. Pappus hairs 7-9 mm long plumose, deciduous.

Fl. June

Distrib. India: Jammu & Kashmir.

Europe.

17. Saussurea DC.

Herbs, annual, biennial or perennial, glabrous or tomentose. Leaves radical and cauline, alternate, unarmed, entire, toothed, pinnatifid or pinnatisect. Heads homogamous, solitary, corymbose or panicled, sessile or peduncled. Involucre ovoid, oblong, globose or hemispheric; bracts many-seriate, erect, not spiny, tips usually rigid and sharp; inner ones narrower and longer than the outer. Receptacle flat or convex, usually densely bristly, rarely naked. Flowers usually bluish or purple, all bisexual and similar; tube slender; limb narrow, 5-fid. Filaments free, glabrous; anther bases sagittate; auricles connate; tails usually long, entire, ciliate or woolly. Style arms linear. Achenes oblong, 4-10-ribbed, glabrous, smooth or rugose, top truncate, cupular or crowned with thickened disc and persistent base of style. Pappus hairs 1-2-seriate or many seriate; outer usually of rigid scabrid bristles, rarely feathery or absent; inner feathery, base thickened and connate into a deciduous ring.

Temperate Asia, Australia, Europe and W. and N. America; ca 403 species, 61 in India.

Note. J.D. Hooker (1881) placed the genus under the tribe Cynaroideae, subtribe Carduineae, and treated the species under two subgenera, viz., *Eusaussurea* and *Eriocoryne*. *Eusaussurea* has been further grouped into 6 sections. Lipschitz (1979) has treated the Indian species under 5 subgenera and each subgenus has been further grouped into different sections. In the present treatment the genus has been dealt as such, without any subdivisions.

Literature. HAJRA, P.K. (1988). Brahmakamal & its allies in India. Dehra Dun. LIPSCHITZ, S.J. (1979). *Rod Saussurea* DC. (Asteraceae). Leningrad.

KEY TO THE SPECIES

1a. Achenes shortly prickly in upper part; pappus hairs many-seriate — **11. S. ceratocarpa**
b. Achenes smooth or rugose; pappus hairs 1-2-seriate — 2

2a. Herbs usually densely woolly — 3
b. Herbs usually not densely woolly — 12
3a. Receptacle naked — 4
b. Receptacle with bristles — 5
4a. Leaves linear-lanceolate, acute at apex; pappus white — **40. S. nishiokae**
b. Leaves broadly rounded at apex; pappus nut brown — **19. S. depsangensis**
5a. Herbs, dwarf, densely tufted — 6
b. Stem distinct, 10.5-30 cm high — 8
6a. Leaves linear-spathulate, entire at margins — **5. S. aster**
b. Leaves oblong-obovate or obovate-lanceolate or linear-lanceolate, toothed at margins — 7
7a. Leaves oblong-obovate or obovate-lanceolate; pappus white or dull white — **23. S. glacialis**
b. Leaves linear-lanceolate; pappus pale brown or dull blue — **25. S. gnaphalodes**
8a. Heads solitary — **27. S. graminifolia**
b. Heads in dense clusters — 9
9a. Heads deeply embedded in woolly hairs — **26. S. gossypiphora**
b. Heads exposed or partially exposed outside the woolly hairs — 10
10a. Leaves linear-oblong, pinnatifid or rarely denticulate-sinuate — **49. S. simpsoniana**
b. Leaves narrow, obovate, spathulate or rhomboid, subentire or dentate — 11
11a. Leaves subentire, sometimes minutely lobulate at apex — **58. S. tridactyla**
b. Leaves in upper half dentate, broadly obovate at apex — **35. S. medusa**
12a. Heads enclosed in floral, boat shaped, papery bracts or bracteate by broad, obtuse, appressed leaves — 13
b. Heads not enclosed in floral, boat shaped papery bracts — **37. S. nana**
13a. Dwarf, generally 2-6 cm high herbs. — 14
b. Stems always well developed, erect, 8-70 cm high — **30. S. hookeri**
14a. Leaves linear, grass like, 0.2-0.3 cm broad; heads bracteate by broad, obtuse, appressed leaves — 15
b. Leaves broad, not grass like; heads enclosed in boat shaped bracts — **59. S. uniflora**
15a. Heads solitary, large, 2.5-5 cm (3-5 in *S. uniflora* var. *conica*) — 16
b. Heads many, (rarely solitary), comparatively small, 1.2-2.5 cm in diam. — **42. S. obvallata**
16a. Floral bracts pale yellow; heads glabrous — **8. S. bracteata**
b. Floral bracts pale-pinkish; heads villous — 18
17a. Stems stout, 0.3-3.5 m high — 36
b. Stems 2.5-30 cm high or dwarf, stemless — **18. S. deltoidea**
18a. Terminal lobes of leaves large, deltoid — 19
b. Terminal lobes of leaves not as above — 20
19a. Heads sessile, in clusters — 21
b. Heads panicled, solitary or in corymbs — **16. S. costus**
20a. Herbs 1-2.5 m tall; leaves glabrate beneath — **32. S. laneana**
b. Herbs 0.6-0.9 m high; leaves woolly beneath — 22
21a. Heads in terminal panicles, lateral branches racemose — 23
b. Heads solitary or in corymbs — **36. S. nagensis**
22a. Leaves pinnatisect; lobes apiculate — **17. S. crispa**
b. Leaves sinuate dentate or lyrate pinnatifid — 24
23a. Heads in corymbs — 35
b. Heads solitary and terminal — 25
24a. Stems winged by decurrent leaf bases — 26
b. Stems not winged by decurrent leaf bases — **10. S. candolleana**
25a. Outer pappus bristles short, scabrid — **12. S. chenopodifolia**
b. Outer pappus bristles absent — 27
26a. Stems usually 2-3 m tall; involucral bracts glabrous, rarely cottony — 28
b. Stem up to 1.5 m high — **2. S. albescens**
27a. Inflorescence not diffuse; capitula many

b. Inflorescence diffuse; capitula few	**20. S. diffusa**
28a. Outer pappus absent	29
b. Outer pappus present	33
29a. Achenes muricate, 5-angled	**28. S. heteromalla**
b. Achenes smooth or somewhat tubercled	30
30a. Leaves entire	31
b. Leaves lyrate-pinnatifid	32
31a. Cauline leaves ca 15 cm long	**22. S. gilesii**
b. Cauline leaves 1-5 cm long	**34. S. leptophylla**
32a. Achenes 10-ribbed	**13. S. chitralica**
b. Achenes 4-angled	**52. S. stracheyana**
33a. Pappus bristles short, scabrid	**3. S. jacea**
b. Pappus bristles all feathery	34
34a. Leaves linear-lanceolate, almost entire; corymbs lax	**45. S. pantlingiana**
b. Leaves ovate-oblong or oblong, sharply toothed; corymbs dense	**46. S. piptathera**
35a. Leaves lyrate or lyrate-pinnatifid; pappus single; achenes tubercled.	**7. S. auriculata**
b. Leaves oblong or oblong-lanceolate; pappus double; achenes not tubercled	**21. S. fastuosa**
36a. Dwarf, stemless or with scape like stem	37
b. Stems distinct, 2.5-30 cm high	53
37a. Anther tails short, entire	38
b. Anther tails woolly or laciniate or fimbriate	39
38a. Inflorescence usually 3-5 cm in diam.; heads usually many; pappus white	**50. S. stella**
b. Inflorescence 1-2 cm in diam.; heads usually a few; pappus grey to light brown	**57. S. thomsonii**
39a. Anther tails woolly or laciniate or fimbriate	40
b. Anther tails woolly	41
40a. Leaves pinnate or pinnatifid; achenes muricate	**61. S. yakla**
b. Leaves broadly obovate or elliptic, toothed; achenes glabrous	**6. S. atkinsonii**
41a. Leaves pinnatifid or pinnate	42
b. Leaves not pinnatifid	50
42a. Achenes glabrous	43
b. Achenes transversely rugose or muricate	46
43a. Leaves obovate-oblong or oblanceolate, lyrate or sinuate-pinnatifid or subruncinate	44
b. Leaves linear-elongate, runcinate-pinnatifid	45
44a. Heads 0.6-0.8 cm across, short peduncled	**39. S. nimborum**
b. Heads 1-2.5 cm across, sessile	**51. S. stoliczkai**
45a. Scapiflorus stems many or absent	**9. S. caespitosa**
b. Scapiflorus stems many	**56. S. taraxacifolia**
46a. Achenes transversely rugose	**44. S. pachyneura**
b. Achenes muricate	47
47a. Involucral bracts tipped with dark purple	**55. S. sughoo**
b. Involucral bracts not tipped with dark purple	48
48a. Heads 0.5-1 cm across; involucral bracts ovate	**41. S. obscura**
b. Heads 1.2-3.7 cm across; involucral bracts lanceolate	49
49a. Receptacle without bristles	**47. S. polystichoides**
b. Receptacle bristly	**33. S. leontodontoides**
50a. Pappus double, both feathery	**60. S. wernerioides**
b. Outer pappus of scabrid bristles or absent	51
51a. Involucral bracts densely hairy at tips	**54. S. sudhanshui**
b. Involucral bracts not densely hairy at tips	52
52a. Leaves 0.5-1 cm long; heads ca 1.2 cm x 0.5-0.7 cm	**53. S. subulata**
b. Leaves 2.0-7.0 cm long; heads 1.5-2 x 1.5-2 cm	**15. S. columnaris**
53a. Heads in terminal corymbs	54
b. Heads usually solitary	55

54a. Receptacle naked	**43. S. ovata**
b. Receptacle bristly	**14. S. clarkei**
55a. Leaves pinnatifid or with very short, distant lobes	56
b. Leaves entire or nearly so	61
56a. Leaves glabrous on both surfaces	57
b. Leaves white tomentose or cottony beneath	58
57a. Achenes smooth, 4-angled	**38. S. nepalensis**
b. Achenes muricate	**3. S. andersonii**
58a. Achenes muricate	**54. S. sughoo**
b. Achenes smooth	59
59a. Leaves cottony above and beneath	**56. S. taraxicifolia**
b. Leaves glabrous above and white tomentose beneath	60
60a. Leaves linear-elongate, sinuate-pinnatifid	**4. S. andryaloides**
b. Leaves obovate-oblong or lanceolate-oblong, lyrate pinnatifid	**1. S. abnormis**
61a. Leaves glandular pubescent or puberulous	**24. S. glanduligera**
b. Leaves not glandular pubescent	62
62a. Cauline leaves half amplexicaul	**48. S. roylei**
b. Cauline leaves linear-oblong	**29. S. hieracioides**

1. Saussurea abnormis , Lipschitz in B.J. URSS. 56: 826. 1971 & Rod Saussurea 136. 1979. *S. neglecta* Ludlow in Bull. Brit. Mus. (Nat. Hist.) B. 5: 279. t. 23A. f. 4. 1976.

Herbs, erect, ca 30 cm high. Basal leves obovate-oblong or lanceolate-oblong, lyrate-pinnatifid, 12.18 x 1.5-4 cm; lateral lobes irregularly sinuate-dentate, cottony or woolly above, densely white tomentose beneath; cauline leaves sessile. Heads solitary, 2-4 cm across, long peduncled; peduncles 15-17 cm long. Involucral bracts 4-5-seriate, narrowly lanceolate, or linear, acuminate; outer 6-8 x 0.75 mm; intermediate 8-11 x 1-1.25 mm; inner 12-13 x 1 mm, ciliate at margins. Flowers white, ca 1 cm long. Anthers 4-4.5 mm long. Achenes 3.5 mm long, smooth. Pappus ca 1 cm long, feathery.

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, subalpine regions, in open places, 3000-3600 m. Uttar Pradesh.

Nepal.

Note. This species is allied to *S. deltoidea* and *S. auriculata* but differs being much smaller than either of these species.

2. Saussurea albescens (DC.) Sch.-Bip. in Linnaea 19: 330. 1846. *Aplotaxis albescens* DC., Prodr. 6: 540. 1838; Hook.f., Fl. Brit. India 3: 374. 1881.

Herbs, 2-3 m tall, erect, slender. Leaves acute or acuminate, entire or sinuate lobed or sub-pinnatifid, (very vriable), 10-30 cm; teeth apiculate; lower leaves, narrowly oblong, glabrous, scabrid or cobwebby above with slender branching nerves, petioled;

upper ovate or linear or oblong-ovate, sessile. Heads ca 1.2 cm across, terminal and axillary, flat topped, long peduncled, corymbs narrow, erect. Involucral bracts purplish, erect, cottony or rarely glabrous, rigid; outer ovate-acute; inner lanceolate. Receptacle very narrow, bristles longer than the achenes. Corolla 1.2 cm long. Anther tails fimbriate. Achenes ca 2.5 mm long, top much cupped, muricate. Pappus white, 0.8-1.2 cm long.

Fl. & Fr. June - Oct.

Distrib. India: W. Himalayas, in dry wastelands, 1700 - 3600 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal, Pakistan and Afghanistan.

3. Saussurea andersonii C.B. Clarke, Comp. Ind. 226. 1876; Hook.f., Fl. Brit. India 3: 370. 1881.

Herbs, 7.5-15 cm high, glabrous. Leaves linear-elongate, runcinate-pinnatifid, ca 6-20 cm; lobes distant, small, ovate and acute or subulate, membranous, pale beneath, sessile or petioled. Heads solitary 1.2-2.5 cm across. Involucral bracts ovate or ovate-lanceolate with dark borders. Receptacle bristles few. Anther tails woolly. Achenes muricate. Pappus dark brown; outer absent.

Fl. & Fr. Sept. - Oct.

Distrib. India: E. Himalayas, in alpine regions, 3500-4000 m. Sikkim and West Bengal.

Endemic.

Note. This species closely resembles *S. taraxacifolia* but is perfectly glabrous. The achenes and pappus are also very different.

4. Saussurea andryaloides (DC.) Sch.- Bip. in Linnaea 19: 331. 1846. *Aplotaxis andryaloides* DC., Prodr. 6: 543. 1838. *S. falconeri* Hook.f., Fl. Brit. India 3: 369. 1881. *S. crassicaulis* C.B. Clarke ex Pamp., Fl. Carac. 218. 1930.

Stem 2.5-25 cm, very stout, cottony or woolly. Leaves linear-elongate, irregularly sinuate-pinnatifid or toothed, 7.5-15 x 1.2-0.6 cm, cottony above, more so beneath, petioled. Heads 2.5-5 cm across. Involucral bracts pale, linear-lanceolate, cottony, erect. Receptacle bristles shorter than achenes. Corolla ca 1.8 cm long. Anther tails short, woolly. Achenes smooth. Pappus double or single.

Fl. & Fr. Sept.

Distrib. India: W. Himalayas, 3600-4800 m. Jammu & Kashmir and Uttar Pradesh.

Pakistan.

Note. There are only 2 sheets in DD, one from Kashmir and the other from Kumaon.

5. Saussurea aster Hemsl. in J. Linn. Soc. 30: 115. 1894.

Monocarpous herbs(?); stems absent. Roots fusiform. Leaves linear-spathulate or linear, ca 2.5 cm long, membranous, hairy or at length lacking and somewhat decayed, sessile. Heads crowded, ca 3.5 cm across, ca 40-flowered. Involucral bracts few-seriate, as long as or shorter than flowers, ovate-oblong or linear, membranaceous, scarious, acute, minutely hairy. Receptacle bristles short. Flowers purple. Achenes short, glabrous. Pappus ca 10-12, biseriate; outer smaller, scabrid; inner long, hairy.

Fl. & Fr. Sept. - Oct.

Distrib. India: W. Himalayas, in sandy gravelley soil, 4800-5800 m. Jammu & Kashmir and Himachal Pradsh.

Tibet.

Note. This species is allied to *S. gnaphalodes* but differs from it by leaves being linear spathulate and heads sessile.

6. Saussurea atkinsonii C.B. Clarke, Comp. Ind. 224. 1876; Hook.f., Fl. Brit. India 3: 367. 1881.

Herbs, stemless. Leaves spreading from the root, broadly obovate or elliptic, 5-10 x 2-5 cm, membranous, toothed, sessile or shortly petioled; petiole up to 3 cm long. Heads blue, solitary, 1.8-2.5 cm across, sessile. Involucral bracts variable; outer ovate-lanceolate inner linear-oblong, scarious. Corolla 1.2 cm long. Receptacle naked or entire. Anther tails shortly fimbriate. Achenes glabrous. Pappus 1.2 cm long; outer pappus bristles few, scabrid.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, amidst boulders, ca 3000-4500 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Endemic.

7. Saussurea auriculata (Spreng. ex DC.) Sch.-Bip. in Linnaea 19: 331. 1846. *Cnicus auriculatus*, Wallich, Cat. 100 n. 2899. 1831. *Aplotaxis auriculata* Spreng. ex DC., Prodr. 6: 541. 1838. *Saussurea hypoleuca* Spreng. ex C.B. Clarke, Comp. Ind. 234. 1876; Hook.f., Fl. Brit. India 3: 374. 1881.

Herbs, 0.6-1.6 m high, glabrous or puberulous, usually simple. Leaves variable in breadth, lyrate or lyrate-pinnatifid, sinuate-toothed, 7.5-20 cm long, terminal lobe large, deltoid, glabrous above, cottony or white beneath, membranous. Heads solitary, 1.5-4 cm across, nodding, long peduncled; peduncle 5-20 cm long. Involucral bracts dark purplish, many, lanceolate, linear, acuminate papery, often recurved. Receptacle bristles long. Corolla ca 8 mm long. Anther tails long, subulate, entire or split near the tip. Achenes ca 4 mm long, 4-angled, tubercled. Pappus brown, ca 8 mm long, brown, single.

Fl. & Fr. Aug. - Oct.

Distrib. India: Himalayas, on open slopes and amidst shrubs, 2000-4300 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal and Bhutan.

8. Saussurea bracteata Decne. in Jacq., Voy. Inde 94. t. 102. 1843. *S. schultzii* Hook.f., Fl. Brit. India 3: 366. 1881.

Herbs, 7.5-35 cm high, very stout, scaberulous, simple. Basal leaves linear-lanceolate or narrowly elliptic, acute, coarsely toothed, 7-10 x 1.5-2.5 cm, narrowed into a short petiole; upper halfamplexicaul, acuminate, sessile. Floral bracts , purplish, cymbiform, 2.5-5 cm long, often as broad enclosing solitary, large, sessile subsilky head. Heads 1.5-2 cm across; peduncles short, stout, densely woolly. Involucral bracts blackish, lanceolate, acuminate. Corolla ca 1.2 cm long. Anther tails short, woolly. Achenes glabrous. Pappus white; outer bristles scabrid.

Fl. & Fr. July - Oct.

Distrib. India: W. Himalayas, on open slopes, alpine meadows, amidst boulders with *Gentiana* sp., *Primula* sp. etc., 3500-5600 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Central Asia and Pakistan.

9. Saussurea caespitosa (DC.) Wallich ex Sch.-Bip. in Linnaea 19: 330. 1846. *Aplotaxis caespitosa* DC., Prodr. 6: 539. 1838 (p.p.). *Saussurea caespitosa* Wallich, Cat. n. 2913. 1831. *S. taraxacifolia auct.*; Hook.f., Fl. Brit. India 3: 368. 1881. p.p.

Herbs, densely tufted; scapiflorus stems 2.5-15 cm long absent or several, slender, occasionally upper branches 2-3-headed, base generally densely clothed with fibrous remains of withered petioles. Leaves sinuate, dentate to pinnatisect, 0.7-1 cm broad, segments minute, narrow, 3.5-5 mm broad; basal leaves usually overtopping the stem. Heads solitary, medium sized. Receptacle densely bristly. Anther tails short, woolly. Achenes glabrous. Outer pappus hairy, few, scabrid.

KEY TO THE VARIETIES

1a. Stems 2.5-15 cm long — **9.1.** var. **caespitosa**
b. Stemless herbs — **9.2.** var. **depressa**

9.1. var. **caespitosa**

Fl. & Fr. Aug. - Sept.

Distrib. India: Himalayas. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal.

9.2. var. **depressa** (Hook.f.) Lipschitz, Rod Saussurea 161. 1979. *S. taraxacifolia* var. *depressa* Hook.f., Fl. Brit. India 3: 368. 1881.

Fl. & Fr. Aug. - Sept.

Distrib. India: Himalayas, on south facing dry slopes, along river bed, 4500-4600 m. Jammu & Kashmir, Uttar Pradesh and Sikkim.

Nepal

10. Saussurea candolleana Wallich ex DC., Prodr. 6: 541. 1838, pro syn. *S. candolleana* Wallich ex Sch.-Bip. in Linnaea 19: 331. 1846 *Aplotaxis candolleana* DC., Prodr. 6: 541. 1838; Hook.f., Fl. Brit. India 3: 372. 1881.

Herbs, erect, 30-90 cm high, more or less winged by decurrent petioles. Leaves oblong or ovate-lanceolate, acute or acuminate, denticulate, 7.5-15 x 1.5-8.5 cm, glabrous above, cottony beneath, abruptly narrowed below the middle. Heads cylindrical, 1.2-1.8 cm across, 12-15 mm long in dense terminal corymbs. Involucral bracts ovate, obtuse or acute, glabrous or silky. Receptacular bristles longer than achenes. Corolla 6-8 mm long. Anther tails fimbriate. Achenes narrow, ca 5 mm long, 4-5 angled, smooth. Outer pappus bristles short, scabrid.

Fl. & Fr. Sept. - Oct.

Distrib. India: Himalayas, on open places, 2100-5000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Pakistan, Nepal and Bhutan.

11. Saussurea ceratocarpa Decne. in Jacq. Voy. Inde 4: 93, t. 101. 1843 et in Walpers, Repert. Bot. Syst. 2: 668. 1843. *Jurinea ceratocarpa* (Decne.) Benth. in Benth. & Hook.f., Gen. Pl. 2: 474. 1873; Hook.f., Fl. Brit. India 3: 378. 1881.

Stems absent or up to 60 cm high, much branched, scaberulous. Leaves (radical and lower cauline usually runcinate) linear-oblong or lanceolate, entire or pinnatifid, 5-12.5 cm long, green on both surfaces or white tomentose beneath, base auricled; lower petioled upper sessile. Heads 2.5-3.5 cm in diam., sessile or stout peduncled, bracteate by linear leaves. Involucral bracts lanceolate-acuminate; outer linear; inner very slender, erect or recurved. Receptacular bristles longer than achenes. Corolla 1.2 cm long. Anther tails long, laciniate. Achenes brown, 4-5-angled, angles thickened ending in erect spines, rough. Outer pappus bristles few, scabrid.

KEY TO THE VARIETIES

1a. Stem well developed, up to 60 cm high	**11.1. var. ceratocarpa**
b. Stemless or nearly so	**11.2. var. depressa**

11.1. var. ceratocarpa

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, 3000-5000 m. Jammu & Kashmir and Himachal Pradesh.

11.2. var. depressa (C.B. Clarke ex Hook.f.) Lipschitz, Rod Saussurea 42. 1979. *Jurinea ceratocarpa* Benth. var. *depressa* C.B. Clarke ex Hook.f., Fl. Brit. India 3: 378. 1881.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, 4300-5000 m. Jammu & Kashmir and Uttar Pradesh.

Tibet.

12. Saussurea chenopodifolia Klatt, Sitzungsuer. Math. Physik. Kl. Akad. Wiss. Munchen 8, 1: 92. 1878; Hook.f., Fl. Brit. India 3: 374. 1881. (as synonym) *S. decurrens* Hemsl. in Hook. Icones 18: t. 1735. 1888.

Stems 60-90 cm high, erect, simple, striate. Leaves few oblong-lanceolate, sinuate-lobate 5-15 x 0.8-12 cm, lobes acute or mucronate, glabrescent, sessile. Heads cylindrical, narrow, laxly corymbose, ca 1 mm across, ca 1.5-2 cm long, 12-15-flowered. Involucral bracts 7-8-seriate, glabrous or minutely puberulous, rigid, acuminate. Receptacular bristles soft, slender, much longer than achenes. Pappus white, shorter than flowers, long hairy; outer absent.

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas, 2500-3500 m. Jammu & Kashmir.

Pakistan.

13. Saussurea chitralica Duthie in Ann. Bot. Gard. Calc. 9. pt. 7, 45. 1901.

Herbs, 60-65 cm high, simple below; branches sulcate. Leaves mostly towards base of stems, dark green and somewhat scabrous above, clothed beneath with white cottony pubescence; lower lyrate-pinnatifid, 10-12 x 3-5 cm; upper smaller, lanceolate, acute, dentate. Heads in terminal corymbs or solitary in the axils of much reduced upper leaves, 1-2.5 cm across, erect or somewhat inclined, tapering at base. Involucral bracts tinged with purple, glabrous; outer ovate, acute; inner lanceolate, acuminate. Receptacle densely bristly. Corolla pale purple, 15 mm long, slender. Anther tails lacerate. Achenes 3 mm long, 10-ribbed. Pappus white, shorter than corolla; outer bristles absent.

Fl. & Fr. May - Aug.

Distrib. India: W. Himalayas, ca 2500 m. Jammu & Kashmir.

Pakistan and Afghanistan.

Note. Allied to *S. heteromalla* but for broader and glabrous involucral bracts. According to R.R. Stewart (1972) this species is known from a solitary sheet deposited at Kew and may be part of the *S. albescens* complex. In DD there are two sheets collected by Harsukh from Ziarat.

14. Saussurea clarkei Hook.f., Fl. Brit. India 3: 372. 1881.

Herbs, 10-15 cm high, stout, pubescent. Leaves obovate, acute, sharply toothed, 10-12.5 cm, membranous, puberulous above, cottony or glabrate beneath, sessile or with winged petiole. Heads in a dense terminal cluster, ca 8 mm across. Involucral bracts

glabrous or cottony; outer ovate, acute; inner lanceolate, acuminate. Receptacle bristles longer than achenes. Pappus brown.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, on open hill slopes, ca 4500 m. Jammu & Kashmir.

Endemic.

15. Saussurea columnaris Hand.-Mazz. in Notizbl. Bot. Gart. Berl. 13:652. 1937. *S. subulata auct. non* C.B. Clarke, Diels in Notes Roy. Bot. Gard. Edinb. 7: 179. 1912.

Herbs, tufted 2.5-7.5 cm high. Leaves rosulate, linear-subulate, 2-7 cm long, acuminate, revolute, white-tomentose beneath. Heads deep blue, crimson or rose purple, 1.5-2 cm in diam.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, in alpine regions, open rocky pastures, 4500-5500 m. Jammu & Kashmir.

China.

16. Saussurea costus (Falc.) Lipschitz in Bot. J. URSS 49: 131. 1964 et Rod Saussurea 92. 1979. *Aucklandia costus* Falc. in Annual. Magaz. Natur. Hist 6: 34: 475. 1841. *Saussurea lappa* (Decne.) Sch.-Bip. in Linnaea 19: 331. 1846; Hook.f., Fl. Brit. India 3: 376. 1881. *Aplotaxis lappa* Decne. in Jacq. Voy. Bot. 96.t. 104. 1853.

Eng.: *Costus;* Hindi: *Kuth;* Sans.: *Kashmirja.*

Herbs, 1-2.5 m tall, simple, pubescent. Basal leaves with petiole 60-90 cm long; terminal lobe sometimes ca 30 cm across, irregularly toothed, membranous, scaberulous above, glabrate beneath; petiole lobately winged; cauline half amplexicaul at base, 15-30 cm long, sessile or with shorter petiole. Heads subglobose, axillary or in terminal clusters of 2-5, 2.5-3.7 cm across. Involucral bracts purple, ovate-lanceolate. Receptacle bristles very long. Corolla dark purple. Anther tails fimbriate. Achenes curved, compressed, ca 8 mm. Pappus hairs brown, double, all feathery.

Fl. & Fr. June - Sept.

Distrib. India: W. Himalayas, in subalpine regions, 3200-3800 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Pakistan.

Note. This plant is cultivated for the roots which are used in perfume industry, incense, and medicine.

17. Saussurea crispa Vaniot in Bull. Geogr. B. Le Mans. 12: 21. 1903. *Cnicus niveus* Wallich *nom. nud. Aplotaxis nivea* DC., Prodr. 6: 541. 1838. *Saussurea deltoidea* var. *polycephala* C.B. Clarke, Comp. Ind. 236. 1876. *Saussurea deltoidea* var. *nivea* (DC.) Hook.f., Fl. Brit. India 3: 375. 1881. *S. microdeltoidea* Kitam. in Acta Phyt. Geobot. 19: 14. 1961.

Herbs, 1-3 m tall, simple, corymbosely branched above. Leaves ovate or deltoid-lanceolate, sinuate-dentate or lyrate-pinnatifid, cuneate at base, acute, or obtuse, 5-35 x 2-13 cm, scaberulous above, white tomentose beneath. Heads subglobose, in terminal panicles, clustered, 10-15 mm across, subsessile or shortly peduncled. Involucral bracts pruplish red at margins, ovate, obtuse. Corolla pale purple, ca 6 mm. Anther tails subulate, nearly entire. Achenes very variable. Pappus ca 6 mm long.

Fl. & Fr. Sept. - Feb.

Distrib. India: Oepn forests and scrubs, 1000-2000 m. Arunachal Pradesh, Sikkim, Manipur, Meghalaya and Nagaland.

Nepal, Myanmar, S.W. China, Indo-China and Thailand.

Note. Very variable plant.

18. Saussurea deltoidea (DC.) Sch.-Bip. in Linnaea 19: 331. 1846. *Aplotaxis deltoidea* DC., Prodr 6: 541. 1838. *Cnicus deltoideus* Wallich, Cat. 100, n. 2994. 1831; Hook.f., Fl. Brit. India 3: 374. 1881.

Stems 1.2-2.6 m tall, grooved, glabrous, pubescent or cottony, simple below, branched above. Basal leaves 22-25 x 8.15 cm or more; cauline 12-26 x 3.5-10 cm; white tomentose or cottony beneath, glabrous or scaberulous above, lower lyrate-pinnatifid; terminal lobe large, deltoid; lateral variable. Heads extremely variable, scattered or fascicled, 1.2-3.7 cm across, sessile or peduncled. Involucral bracts purple at margins and tips, hoary, short, ovate or lanceolate, obtuse. Receptacular bristles shorter than pappus. Corolla 1.2-1.6 cm long. Anther tails subulate, nearly entire. Achenes 3-5 mm, smooth or tubercled. Pappus white, single, equalling the corolla.

Fl. & Fr. Aug. - Sept.

Distrib. India: Himalayas and N.E. India; 1600-3400 m, Jammu & Kashmir, Uttar Pradesh, W. Bengal, Arunachal Pradesh, Meghalaya, Nagaland and Manipur.

Nepal, Bhutan, Myanmar, Indo-China, S. China, Taiwan and Thailand.

19. Saussurea depsangensis Pamp., Aggiunte Fl. Caracorum (Lav. Inst. Bot. Univ. Cagliari 22): 176-177, t. 9.f. 4. 1934.

Leves rosulate, large below, 2-2.5 cm long, otherwise short, apex broad, rotundate, base attenuate to petiole; petiole 0.5-1.0 cm long; upper leaves bract like, white tomentose. Heads relatively large, 1.5-2 cm high and 0.8-0.9 cm in diam. Receptacle naked. Pappus pale.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, 5000 m. Jammu & Kashmir.

China.

20. Saussurea diffusa Lipschitz, Rod Saussurea 141-142. 1979. *S. albescens* var. *brachycephala* Hook.f., Fl. Brit. India 3: 374. 1881. *S. platycephala* C.B. Clarke, *nom. nud.*

Herbs, erect, 1.5-2 m tall. Leaves entire or sinuate-lobed, very scabrid above. Inflorescence generally diffused. Heads ca 1.2 cm long on shorter branches, rounded at base. Involucral bracts ovate. Corolla 8 mm long. Anther tails fimbriate. Achenes ca 2 cm long. Pappus hairs 8 mm long.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas. Jammu & Kashmir.

Pakistan.

Note. This species differs from *S. albescens* by its diffuse inflorescence, fewer and broader capitaula, and longer peduncles.

21. Saussurea fastuosa (Decne.) Sch.-Bip. in Linnaea 19: 331. 1846. *Aplotaxis fastuosa* Decne. in Walpers Repert. B. Syst. 669. 1843; *Saussurea denticulata* Wallich ex C.B. Clarke, Comp. Ind. 234. 1876, non Ledeb.; Hook.f., Fl. Brit. India 3: 375. 1881.

Stems 0.3-1.25 m, simple below, branched above, glabrous or cottony. Leaves oblong or oblong-lanceolate, acute or acuminate, finely toothed, 14-18 x 2.5-4.8 cm, glabrous or cottony beneath, sessile or short petioled. Heads solitary, terminal, 2-6 cm across, usually subtended by small leaf. Involucral bracts glabrous, rigid, obtuse; outer ovate; inner purple, linear-oblong. Receptacular bristles flattened, exceeding the involucre. Corolla ca 1.2 cm long. Achenes compressed to narrowly obovoid, ca 5 mm long, strongly many-ribbed. Pappus pale brown, ca 1.2 cm long, double, hairs all feathery.

Fl. & Fr. Aug. - Oct.

Distrib. India: Himalayas, in *Acer-Aesculus* forest or in open places, 2500-3500 m. Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal, S. Tibet, N. Myanmar and S.W. China.

22. Saussurea gilesii Hemsl. in Hook. Icones 18: t. 1736. 1888.

Herbs, erect; branches 45-75 cm high, striate. Cauline leaves slender, narrowly lanceolate, acute or subobtuse, ca 15 cm long. Involucral yellowish green, bracts many, few-seriate, linear lanceolate, acute, hispid. Receptacular bristles narrowly acute, longer than achenes. Pappus white, long hairy.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, 3000-4600 m. Jammu & Kashmir and Himachal Pradesh.

Pakistan.

23. Saussurea glacialis Herd. in Bull. Soc. Nat. Mosc. 40, 3: 144. 1867. *S. sorocephala auct. non* Shrenk. *S. chthonocephala* Bornm. in Fedde. Repert. Beih. 108. 1. 59. 1938.

Plants polycarpic; rhizome thick, long. Leaves radiating from a common centre, not regularly arranged, densely white tomentose or sparingly tomentose or subglabrous, green or turning red. Inflorescence hemispheric. Involucral bracts often red, scarious. Pappus white or dull white.

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, ca 5500 m. Jammu & Kashmir and Uttar Pradesh.

C. Asia, W. Siberia and China.

24. Saussurea glanduligera Sch.-Bip. ex Hook.f., Fl. Brit. India 3: 371. 1881. *S. glanduligera* var. *major* Hook.f., Fl. Brit. India 3: 371. 1881.

Stems 10-20 cm. Leaves pale green, narrowly linear-lanceolate, irregularly sinuate-toothed, 5-12 x 0.4-0.7 cm, glandular-pubescent or puberulous on both surfaces; petiole

dilated into a narrow, glabrous sheath with often woolly base and margins. Heads solitary 2-3.7 cm across, usually bracteate by linear leaves. Involucral bracts green, lanceolate, erect, pubescent or woolly. Receptacular bristles long. Corolla ca 1.2 cm long. Anther tails short, woolly. Achenes 4-angled, ca 3 mm long, scaberulous. Pappus hairs pale brown or bluish, 1.2 cm; outer pappus bristles short, scabrid.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, on open hill slopes, with *Caragana, Rheum, Corydalis*, etc. 3900-5700 m. Jammu & Kashmir and Himachal Pradesh.

Tibet.

25. Saussurea gnaphalodes (Royle ex DC.) Sch.-Bip. in Linnaea 19: 331. 1846. *Aplotaxis gnaphalodes* Royle ex DC., Prodr. 6: 542. 1838. *Saussurea sorocephala* (Schrenk) Sch.-Bip. in Linnaea 19: 331. 1846. *S. sorocephala* Hook.f. et Thomson. in C.B. Clarke, Comp. Ind. 226. 1876; Hook.f., Fl. Brit. India 3: 377. 1881, p.p. excl syn.

Herbs, dwarf; densely tufted; stems absent or very short, thickly woolly or cottony; rootstock much branched. Leaves variable, obovate-lanceolate or oblong obovate, obscurely toothed, 1.2-2.5 cm, densely woolly on both surfaces. Heads cylindrical, ca 1.3 cm across. Florets often ca 1.2 cm long, embedded in dense woolly hairs. Involucral bracts lanceolate, silky. Achenes narrow, 5-angled. Pappus pale brown or dull blue; outer pappus hairs scabrid, scanty or absent.

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, in moist open places with *Primula* sp., *Gentiana* sp., etc. 4000-5000 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal, Pakistan, C. Asia, W. & S. Tibet and S.W. China.

26. Saussurea gossypiphora D. Don in Mem. Wern. Nat. Hist. Soc. 3: 414. 1821. *S. gossypina* Wallich *nom. illegit.;* Hook.f., Fl. Brit. India 3: 376. 1881.

Stem 10-30 cm high, densely covered with long white or grey woolly hairs, simple, clavate, hollow, leafy. Leaves linear, embedded in very dense woolly hairs, remotely toothed or runcinate-pinnatifid, 2.5-15 x 1.5-0.6 cm, usually glabrous abve, glabrous or woolly beneath, sessile. Heads cylindrical, few or many, 1.3-2 cm long, deeply embedded in woolly hairs. Involucral bracts linear-oblong, short, erect, pubescent or woolly. Receptacle pitted; bristles equalling achenes. Corolla purple, 0.8-1.2 cm long. Anther tails slender, nearly entire. Achenes narrowly obovoid, ca 4 mm long. Pappus hairs few, many, scabrid, or absent.

KEY TO THE VARIETIES

1a.	Inflorescence of a few heads	**26.2.** var. **lilliputa**
b.	Inflorescence of many heads	2
2a.	Inflorescence 3-6 cm in diam.	**26.1.** var. **gossypiphora**
b.	Inflorescence 10-12 cm in diam.	**26.3.** var. **luxuriosa**

26.1. var. **gossypiphora**

Fl. & Fr. July - Sept.

Distrib. India: Himalayas, in open places, amidst boulders, 3500-5700 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal, Bhutan, S. Tibet and S.W. China.

26.2. var. **lilliputa** Lipschitz in Novit Syst. Pl. Vasc. Acad. Sci. URSS 1966: 223. 1966.

Fl. & Fr. July - Aug.

Distrib. India: E. Himalayas, 4300-5000 m. Sikkim.

Endemic.

26.3. var. **luxuriosa** Lipschitz in Novit, Syst. Pl. Vasc. Acad. Sci. URSS 1966: 222. 1966.

Fl. & Fr. July - Aug.

Distrib. India: E. Himalayas 4300-5500 m. Sikkim.

Nepal.

27. Saussurea graminifolia Wallich ex DC., Prodr. 6: 536. 1838; Hook.f., Fl. Brit. India 3: 370. 1881.

Stems 6-25 cm, very stout, much thickened upwards, leafy, densely woolly and shining, rarely glabrate. Leaves narrowly linear from a dilated shining scarious base, quite entire, recurved, flexuous, 5-17 x 0.2-0.4 cm, tomentose beneath. Heads solitary 2.5-3.5 cm across, densely woolly, bracteate by many reflexed or spreading linear leaves. Involucral bracts narrow, lanceolate. Receptacular bristles short. Corolla ca 1 cm long. Anther tails fimbriate. Achenes ca 2.5 mm long. Pappus pale brown; outer pappus bristles many, short, scabrid.

Fl. & Fr. July - Sept.

Distrib. India: Himalayas, on open grassy slopes, 3600-5600 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal, Bhutan and S. Tibet.

28. Saussurea heteromalla (D. Don) Hand.-Mazz. Symb. Sin. 7: 1152. 1936. *Cnicus heteromallus* D. Don., Prodr. Fl. Nepal. 166. 1825. *C. candicans* Wallich, Cat. 99. n. 2893 A. 1831. (*nom. nud.*). *Saussurea candicans* (DC.) Sch.-Bip. Linnaea 19: 330. 1846; Hook.f., Fl. Brit. India 3: 373. 1881. *Aplotaxis candicans* DC., Prodr. 6: 540. 1838. **Fig. 53.**

Stems 0.6-1.6 m, simple below, corymbosely branched above, often many from the base. Basal leaves in a rosette, obovate, lyrate-pinnatifid; upper ones lanceolate-oblong, entire or dentate, glabrous or cottony above, white tomentose beneath. Heads in corymbiform panicles, 2.5-3.7 cm across on 3-15 cm long peduncles. Involucral bracts 3-5 seriate, lanceolate, acuminate, 0.5-1.2 cm long, cottony or pubescent. Receptacular bristles long. Corolla 1.3-1.5 cm long, purple. Anther tails lacerate. Achenes 3 mm long, 4-5-angular, muricate. Pappus hairs white, ca 1.2 cm.

Fl. & Fr. March - Aug.

Distrib. India: In wastelands, dry hill slopes, 550-4000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Bihar and Sikkim.

W. Afghanistan, Pakistan, Nepal, Bhutan and S.W. China.

Note. A very variable species.

29. Saussurea hieracioides Hook.f., Fl. Brit. India 3: 371. 1881.

Stems 10-20 cm, slender, uniformly villous with soft spreading hairs. Basal leaves elliptic, acute, quite entire or obscurely toothed, 3.7-6.7 x 1.8-3 cm, villous on both surfaces; petiole slender; cauline linear-oblong. Heads solitary, 2.5-3.7 cm across, woolly at base. Involucral bracts usually purple margined, ovate-lanceolate. Receptacular bristles short. Corolla ca 3 cm. Anther tails short, very woolly. Achenes very short, smooth. Pappus pale, ca 1.2 cm long; outer pappus bristles scabrid.

Fl. & Fr. Aug. - Sept.

Distrib. India: E. Himalayas, 3700-4950 m. Sikkim.

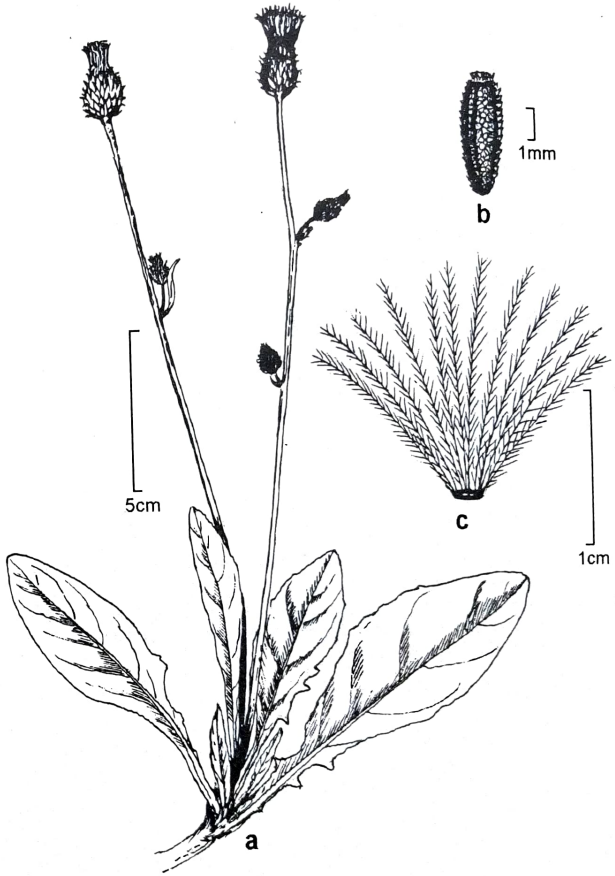

Fig. 53. **Saussurea heteromalla** (D. Don) Hand.-Mazz. : **a.** Habit; **b.** Achene; **c.** Pappus.

Nepal, Bhutan and S. China.

30. Saussurea hookeri C.B. Clarke, Comp. Ind. 230. 1876; Hook.f., Fl. Brit. India 3: 371. 1881.

Stems 10-15 cm, stout, hollow, woolly upwards. Leaves narrowly linear from a dilated scarious base, quite entire, recurved, 5-10 x 0.2-0.3 cm, at margins tomentose beneath. Heads solitary, 2.5-3.5 cm across, bracteate by leaves. Involucral bracts broadly lanceolate or ovate. Corolla ca 1.2 cm. Receptacle with long dense bristles. Achenes short. Pappus ca 8 mm long; outer pappus bristles short, scabrid.

Fl. & Fr. Aug. - Sept.

Distrib. India: Himalayas, 4600-4850 m. Uttar Pradesh and Sikkim.

Nepal, Bhutan, S. Tibet and S.W. China.

31. Saussurea jacea (Klotzsch) C.B. Clarke, Comp. Ind. 233. 1876. *Aplotaxis jacea* Klotzsch, Bot. Ergebn. Reise Pr. Waldem. 1845. 46: 79-80. 1862; Hook.f., Fl. Brit. India 3: 375. 1881.

Stems 0.25-1.2 m tall, simple below, branched above, rigid, puberulous, terete. Leaves ovate or oblong, obtuse or acute, qutie entire, 5-10 x 2.5-6 cm, scaberulous on both surfaces, sessile, half amplexicaul. Heads solitary, 1-2 cm across, on slender peduncles. Outer involucral bracts ovate, obtuse or acute; inner lanceolate, with purple margins. Receptacle narrow, bristles curved, exceeding the involucre. Corolla ca 1.6 cm long. Anther tails subulate, entire. Achenes smooth. Pappus brown, ca 1.2 cm or more long, with double hairs, all feathery.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas from temperate to alpine region, 2900-4900 m. Jammu & Kashmir and Himachal Pradesh.

Afghanistan.

32. Saussurea laneana W.W. Sm. in J. Asiat. Soc. Bengal n.s., 7: 74. 1911.

Herbs, perennial; roots thick, clothed with remanants of many sheaths. Stems 60-90 cm high, simple, 5-10-capitate at apex, more or less two winged. Basal leaves 1-3, triangular, 5-7-lobed, runcinate-pinnatifid, 20-30 x 6-8 cm; terminal lobe triangular, 5-7 cm long, denticular, mucronate, upper surface sparsely scabrid puberulous, densely woolly underneath. Heads subtended by leaf like bracts. Receptacular bristles ca 7 mm long, many, linear, white, exceeding achenes. Anther tails long, woolly. Achenes 3-4 mm long, narrow, glabrous, apex marked with rings. Pappus dark brown, ca 1 cm long, feathery, uniseriate.

Fl. & Fr. Aug. - Sept.

Distrib. India: E. Himalayas, ca 4000 m. Sikkim.

Endemic.

33. Saussurea leontodontoides (DC.) Sch.-Bip. in Linnaea 19: 330. 1846. *Aplotaxis leontodontoides* DC., Prodr. 6: 539. 1838. *Saussurea kunthiana* C.B. Clarke, Comp. Ind. 226. 1876; Hook.f., Fl. Brit. India 3: 369. 1881. *S. leontodontoides* var. *filicifolia* (Hook.f.) Hand.-Mazz., Symb. Sin. 7: 1155. 1936. *Saussurea stoliczkai* (*auct. non* C.B. Clarke) Kitam. in Acta Phyt. Geobot. 24: 8. 1969.

Herbs, dwarf, stemless. Leaves spreading, linear-elongate, pinnatifid or runcinate, 5.5-12.5 cm long, glabrous or pubescent above, white tomentose beneath, petioled, lobes quadrate, semi circular or oblong, entire or lobulate and toothed, tip, teeth and lobes apiculate or mucronate. Heads deep purple, solitary, 2.5-3.7 cm across, sessile. Receptacle bristly. Involucral bracts lanceolate. Anther tails short, woolly. Achenes mucricate. Outer pappus hairs few, scabrid.

Fl. & Fr. Aug. - Oct.

Distrib. India: Himalayas, in subalpine and alpine regions, 3200-5100 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal, S.W. China and Tibet.

34. Saussurea leptophylla Hemsl. in Hook., Icones 18: t. 1734. 1888.

Subwoody, glabrous; branches slender, green, striate. Leaves linear, 1-5 cm long, entire or with a few narrow lobes, rolled inwards. Heads terminal, solitary; peduncle leaf bearing. Involucral bracts 7-8-seriate, rigid, straight. Receptacular bristles narrow, many times longer than achenes. Achenes glabrous. Pappus white, shorter than flowers, feathery; outer absent.

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas in moist places, ca 3200 m. Jammu & Kashmir.

Pakistan and Afghanistan.

35. Saussurea medusa Maxim. in Bull. Acad. Sci. Petersb. 27: 488. 1881. *S. dainellii* Pamp. in Bull. Soc. Bot. Ital. 46: 32. 1915. *S. trullifolia* W.W. Smith in Notes Roy. Bot. Card. Edinb. 12: 220. 1920. *S. namikawae* Kitam. in Acta Phyt. Geobot. 24: 5-6. 1969.

Plants strongly woolly. Basal and lower cauline leaves obovate or rhomboid, apex rotundate; upper leaves many frequently dentate at margin, sometimes long, blade 2.5 cm broad, nerves inconspicuously pubescent; petiole 2.5-3 cm long. Inner involucral bracts oblanceolate or obovate, 2-3 mm broad. Achenes black, large, 5-6 mm long, black.

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, ca 4000 m. Jammu & Kashmir.

Nepal and China.

36. Saussurea nagensis C.E.C. Fischer in Kew Bull. 1940: 36. 1940.

Stems more or less woody below, terete, thinly cottony. Leaves ovate, pinnatisect often very near to midrib, 20-23 x 13-16 cm, membranous; lobes apiculate, 3-4 pairs. Inflorescence panicled, ca 30 mm long, lateral branches racemose, up to 10 cm long, 1-4-capitate. Heads 1.5-2 cm across.

Fl. & Fr. Sept.

Distrib. India: N.E. India, On grassy slopes, ca 2150 m. Nagaland.

Endemic.

37. Saussurea nana (Pamp.) Pamp. in Aggiunte Fl. Caracorum 176. 1934 (excl. syn. *S. humilis* Ostenf.). *S. schultzii* var. *nana* Pamp. in Bull. Soc. Bot. Ital. 46: 33. 1915. *S. bracteata* (*auct. non* Decne.) C.B. Clarke, Comp. Ind. 224. 1876 (p.p.); Hook.f., Fl. Brit. India 3: 366. 1881.

Stems short, 2-6(8) cm high, occasionally almost stemless. Leaves thick, sometimes subcartilaginous, nerves in middle prominently straw coloured; basal leaves narrowly lanceolate, acute, deeply and strongly toothed at margins, rough. Heads solitary, ca 2-2.5 cm in diam. Involucral bracts dark, almost black, apex acute or villose at length.

Fl. & Fr. June - Aug.

Distrib. India: W. Himalayas, in alpine meadows, 4500-6000 m. Jammu & Kashmir and Himachal Pradesh.

Pakistan and China.

38. Saussurea nepalensis Spreng., Syst. Veg. 3: 380. 1826. *S. eriostemon* Wallich ex C.B. Clarke, Comp. Ind. 229. 1876; Hook.f., Fl. Brit. India 3: 370. 1881. *Aplotaxis nepalensis* (Spreng.) DC., Prodr. 6: 539. 1838. *Saussurea chapmanii* C.E.C. Fischer. in Kew Bull. 287. 1938.

Stems 15-30 cm high, stout, nearly glabrous, 1-leaved. Radical leaves linear, pinnatifidly lobed and toothed; lobes and teeth short, broad, acute and aristate. Heads solitary, ca 2.5-3.5 cm across. Involucral bracts lanceolate, subsquarrose. Receptacular bristles long. Anther tails fimbriate. Achenes smooth, 4-angled. Outer pappus absent.

Fl. & Fr. July - Aug.

Distrib. India: E. Himalayas, subalpine and alpine regions, 3200-4900 m. Sikkim.

Nepal, Bhutan and S. Tibet.

39. Saussurea nimborum W.W. Smith in J. et Proc. Asiat. Soc. Bengal n.s. 7, 3: 73-74. 1911. *S. sughoo auct. non* C.B. Clarke.

Herbs, dwarf, more or less stemless. Leaves subruncinate, 1-4, 2-9 x 0.5-3.0 cm; subruncinate; basal leaves elliptic or oblanceolate, irregularly dentate at margins, minutely scabrid above, white tomentose beneath. Heads 1-5, small, (0.6) 1-(0.8) 1.4 cm in diam.; peduncle short, near to apex crowded, scarcely diffused. Involucral bracts yellow green, ovate-lanceolate, appex narrowed. Achenes smooth, oblong, obscurely angled.

Distrib. India: E. Himalayas, 4000-5300 m. Sikkim.

Endemic.

Note. Occasionally the plants are just 1-2 cm high and leaves 1-3, arising from rootstock.

40. Saussurea nishiokae Kitam. in Acta Phyt. Geobot. 24 (1-2): 6-7. 1969.

Plants more or less densely woolly or tomentose. Leaves linear-lanceolate, sinuate denticulate at margins or lower entire, upper dentate, 0.5-1.2 cm broad. Inflorescence usually cauline or sometimes amidst leaves, densely pubescent or white to reddish woolly. Heads 2.5-6 cm across. Receptacle naked. Achenes black, narrow, minutely glandular-pilose. Pappus white.

Fl. & Fr. Sept. - Oct.

Distrib. India: E. Himalayas, 4800 m. Sikkim.

Nepal and Bhutan.

41. Saussurea obscura Lipschitz in Novit, Syst. Pl. vas. Acad. Sci. URSS. 8. 250. 1971. *S. inconspicua* Lipschitz in Novit, Syst. Pl. Vasc. Acad. Sci. URSS, 211. 1968, non Hand.-Mazz. 1939.

Herbs, dwarf, desely tufted; rhizomes thick, longitudinally fibrous. Basal leaves subrosulate, sinuate-dentate or subentire, thick, coriaceous, upper surface with many, rigid hairs. Heads in pairs, sometimes solitary, 0.5-1 cm across. Involucral bracts thick or coriaceous.

Fl. & Fr. July - Aug.

Distrib. India: Sikkim.

Endemic.

42. Saussurea obvallata (DC.) Edgew. in Trans. Linn. Soc. 20: 76. 1846. Hook.f., Fl. Brit. India 3: 365. 1881. *Aplotaxis obvallata* DC., Prodr. 6: 541. 1838. *Carduus obvallatus* Wallich, Cat. 100 n. 2905. 1831 *nom. nud.*

Stem 15-45 cm high, simple, pubescent or glabrate. Basal leaves elongate-obovate, obtuse toothed, 10-22 x 2.5-5 cm, glabrous, stalked; cauline half amplexicaul, oblong, concave. Heads 2-6, hemispheric ca 1-1.8 cm across, enclosed by boat shaped, papery bracts. Involucral bracts often margined with black, lanceolate, 10-12 x 5-6 cm. Corolla pale brown, ca 8 mm. Outer bristles scabrid or absent.

Fl. & Fr. July - Oct.

Distrib. India: Himalayas, in morain on rocky slopes, amidst boulders, 3800-4600 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh.

Nepal, Bhutan, N. Myanmar, S.W. China and Pakistan.

43. Saussurea ovata Benth. in Henders. and Hume, Lahore to Yarkand 325 t. colour. 1873. *S. elliptica* C.B. Clarke ex Hook.f., Fl. Brit. India 3: 372. 1881.

Stems 10-15 cm high, slender, curved. Leaves elliptic-oblong or lanceolate, acute, irregularly toothed, 7.5-10 cm, thinly cottony on both surfaces, flaccid, narrowed into a very slender, cottony, petiole. Heads in small, rather lax terminal corymbs, ca 8 mm across. Involucral bracts lanceolate-acuminate, villous. Receptacle naked. Corolla ca 1.2 cm long. Anther tails laciniate, hardly woolly. Outer pappus bristles numerous, scabrid.

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, ca 4600 m. Jammu & Kashmir.

C. Asia.

44. Saussurea pachyneura Franch. in J. Bot. Paris B. 8: 354. 1894. *S. kunthiana* Wallich ex C.B. Clarke var. *major* Hook.f., Fl. Brit. India 3: 369. 1881. *S. bodinieri* Levl. in Bull. Geogr. B. Le Mans 25: 19. 1915. *S. leontodontoides* (DC.) Hand.-Mazz., Symb., Sin. 7: 1155. 1936.

Herbs, dwarf, stemless. Basal leaves pinnatisect; lobes broadly oblong or ovate, 8-12 mm, sinuate or subpinnatifid, scabrid above. Heads solitary, large, 2-3 cm across. Involucral bracts ovate, glabrous, coriaceous, reflexed in dry state. Anther tails conspicuously woolly. Achenes transversely rugose. Outer pappus hairs scabrid.

Fl. & Fr. Aug. - Sept.

Distrib. India: E. Himalayas, 4300-5300 m. Sikkim.

Nepal, Bhutan and China.

45. Saussurea pantlingiana W.W. Smith in J. et Pro. Asiat. Soc. Bengal n.s. 7, 3: 73. 1911.

Stems 20-30 cm high, simple below. Basal and lower cauline leaves linear-lanceolate, 5-10 x 0.8-1.2 cm, attenuate at base, obtuse or rarely acuminate at apex, petiole 2-3 cm long, middle cauline leaves subamplexicaul. Heads 2-10, 2 cm long, 7-8 mm broad, minutely pubescent. Involucral bracts ovate-lanceolate, acuminate. Receptacular bristles long. Anther tails woolly. Achenes oblong, glabrous. Outer pappus short, sparingly setose.

Fl. & Fr. Sept. - Oct.

Distrib. India: E. Himalayas, ca 4000 m. Sikkim.

Endemic.

46. Saussurea piptathera Edgew. in Trans. Linn. Soc. 20; 76. 1846; Hook.f., Fl. Brit. India 3: 372. 1881. *Aplotaxis discolor* DC., Prodr. 6: 541. 1838.

Stems 30-100 cm high, not winged. Leaves oblong or ovate-oblong, sharply toothed, 9-16 x 5-6 cm, glabrous above, cottony, rarely glabrate beneath, with a contracted or dilated, half amplexicaul, auricled base. Heads in crowded dense corymbs, 0.8-1.2 cm across. Involucral bracts glabrate or silky; outer ovate, obtuse; inner lanceolate, acute. Receptacular bristles longer than the achenes. Outer pappus bristles short, scabrid.

Fl. & Fr. July - Sept.

Distrib. India: Himalayas, on moist exposed slopes, 3500-4600 m. Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal.

47. Saussurea polystichoides Hook.f., Fl. Brit. India 3: 369. 1881.

Herbs, dwarf, stemless. Leaves linear-elongate, pinnatisect, petioled; segments rounded, ovate or subquadrate, spinous toohted, glabrous above, white tomentose beneath. Heads usually 2-2.5 cm acorss, sessile or peduncled, glabrous. Involucral bracts lanceolate acuminate, erect or subsquarrosely recurved. Receptacle without bristles. Anther tails short, woolly. Achenes muricate. Outer pappus hairs few, scabrid.

Fl. & Fr. Aug. - Sept.

Distrib. India: Himalayas, in alpine and subalpine zones ca 4400 m. Uttar Pradesh and Sikkim.

Nepal.

Note. Very closely allied to *S. kunthiana* but the leaves are pinnate, the receptacle without bristles and leaf segments horizontal.

48. Saussurea roylei (DC.) Sch.-Bip. in Linnaea 19: 330. 1846. *Aplotaxis roylei* DC., Prodr. 6: 538. 1838; Hook.f., Fl. Brit. India 3: 370. 1881.

Stems 15-50 cm, stout and thickened below the head. Leaves erect, lanceolate-acuminate, quite entire or sinuate or pinnatifid towards the base only, 7.5-25 x 0.5-2 cm; cauline few, sessile, half amplexicaul, sometimes snow white beneath. Heads 3-4 cm across. Involucral bracts lanceolate, long, straight. Receptacular bristles equallling achenes. Corolla ca 1.2 cm long. Anther tails woolly. Achenes ca 6 mm long, smooth. Pappus pale brown, ca 8 mm long, outer pappus bristles many,

Fl. & Fr. July - Sept.

Distrib. India: W. Himalayas, subalpine and alpine regions, 3000-4900 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal.

49. Saussurea simpsoniana (Field. & Gard.) Lipschitz, Nov. Syst. Pl. Vasc. 1964: 319. 1966. *Aplotaxis simpsoniana* Field. & Gard. Sert. Pl. t. 26. 1844. *Saussurea sacra* Edgew. in Trans. Linn Soc. 20: 76. 1846; Hook.f., Fl. Brit. India 3: 376. 1881.

Kash.: *Yogipadshah.;* Eng.: *Sacred Saussurea.*

Stems 5-15 cm high, densely woolly, simple, clavate. Leaves linear, ca 5-10 cm long, pinnatifid, sessile. Heads many, exposed, woolly, outside. Involucral bracts lanceolate. Achenes 4-5 angled, 2.5-3.5 mm, smooth or warted. Outer pappus hairs scabrid, few, numerous or absent.

Fl. & Fr. July - Oct.

Distrib. India: Himalayas, in the alpine regions, amidst boulders, 4400-5600 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal and Tibet.

50. Saussurea stella Maxim. in Bull. Acad. Sci. Petersb. 27: 490. 1881.

Herbs, dwarf, stemless. Leaves mainly purplish, gradually linear-elongate, dilated at base, subulate-acuminate at apex, entire or inconspicuously dentate. Inflorescence 3-5 cm in diam., usually hemispheric, crowded. Heads sessile, frequently numerous (30). Receptacle bristly, bristles 2-3 mm long. Achenes at apex coronuled; coronules short, 1-1.5 mm long, scarious. Pappus white, biseriate.

Fl. & Fr. Aug. - Sept.

Distrib. India: E. Himalayas. Sikkim.

Bhutan and China.

51. Saussurea stoliczkae C.B. Clarke, Comp. Ind. 225. 1876; Hook.f., Fl. Brit. India 3: 368. 1881.

Herbs, densely tufted, stemless or with short stem, ca 8 cm high. Leaves obovate-oblong or oblanceolate, lyrate or sinuate-pinnatifid, 2.5-5 cm, cottony beneath or on both

surfaces; lobes acute or obtuse, short, very irregular; terminal ovate. Heads 0.8-3 cm across, sessile. Involucral bracts linear-lanceolate, ca 1.6 cm long; outer with broad bases; inner narrower, membranous, with dark tips. Receptacle densely bristly. Anther tails short, woolly. Achenes glabrous, ca 4 mm long. Pappus brown, 1.2 cm.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas, in alpine regions, 4-5000 m. Jammu & Kashmir and Himachal Pradesh.

Nepal and Tibet.

52. Saussurea stracheyana (Kuntze) Lipschitz in Sist. Zam. Gerb. Tomsk. Univ. 84: 26. 1967. *Theodorea stracheyana* Kuntze, Rev. Gen. Pl. 1: 368. 1891. *Aplotaxis foliosa* Edgew. in Trans. Linn. Soc. 20: 77. 1846. *Saussurea edgeworthii* Kitam. in Acta Phyt. Geobot. 24: 4. 1969. *S. foliosa* (Edgew.) Hook.f., Fl. Brit. India 3: 373. 1881.

Herbs, 30-60 cm high, profusely branched. Leaves lyrate-pinnatifid, 7.5-10 cm, puberulous above, cottony beneath; lobes rounded. Heads on slender, long, axillary and terminal peduncles, ca 1.2 cm across. Involucral bracts very slender with acicular points. Receptacular bristles long. Achenes obtusely 4-angled, smooth or somewhat tubercled. Outer pappus absent.

Fl. & Fr. Apr. - July.

Distrib. India: W. Himalayas, 2300-2600 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal.

Note. This species is quite distinct from *S. candicans* in habit and in having smaller heads with subulate bracts, smaller corolla and short pappus.

53. Saussurea subulata C.B. Clarke, Comp. Ind. 226. 1876; Hook.f., Fl. Brit. India 3: 367. 1881.

Herbs, dwarf, densely tufted. Leaves linear-lanceolate subulate at tip, quite entire at margins, revolute to the middle, 1.2-3.5 cm, laxly hairy or glabrate, sparsely woolly towards the base, narrowed into sheathing petiole. Heads solitary, 1.2-2.5 cm across, amongst leaves, sessile. Involucral bracts oblong-lanceolate, acuminate, rigid. Receptacle fimbrillate. Anther tails short and bearded. Achenes smoothly oblong, acutely 5-angled. Outer pappus bristles scabrid.

Fl. & Fr. Sept.

Distrib. India: W. Himalayas, in alpine regions, amidst boulders, 4800-5800 m. Jammu & Kashmir.

Afghanistan.

54. Saussurea sudhanshui Hajra in Indian For. 109(2): 77. 1983.

Densely tufted, sometimes forming hemispherical cushions, 3-6 cm high. Leaves linear-lanceolate, revolute, subulate at apex, entire at margin, 5-7 cm, glabrous above, laxly hairy beneath, narrowed into a sheathing petiole. Heads homogamous, solitary amongst leaves, 1-2 cm across. Involucral bracts variable, lanceolate-acuminate to ovate-acuminate, 10-15 x 3-4 mm, glabrous or sparingly hairy, densely hairy at tip; outer bracts gradually replaced by short concave sheaths of uppermost leaves; inner narrower. Receptacle flat, strigose. Corolla purple, 10-12 mm long. Anthers 5-6 mm long, tails woolly. Achenes 2-3 mm long, glabrous. Pappus brownish, feathery, ca 1 cm long.

Fl. & Fr. Aug. - Oct.

Distrib. India: W. Himalayas, in alpine regions, amidst boulders, in open places, 4500-4800 m. Uttar Pradesh.

Endemic.

55. Saussurea sughoo C.B. Clarke, Comp. Ind. 225. 1876; Hook.f., Fl. Brit. India 3: 368. 1881.

Stems absent or 10-15 cm high. Leaves oblong-obovate or oblanceolate, 7.5 cm long, coarsely toothed or runcinately pinnatifid, coriaceous, scaberulous above, white tomentose beneath; teeth and lobes apiculate; petiole slender, 2.5-3.7 cm. Heads solitary or 2-3, 1.5 cm across, sessile, or short peduncled, glabrous or puberulous. Involucral bracts margined and tipped with dark purple, lanceolate from an ovate base; inner linear-acuminate, scarious. Receptacle bristly. Corolla ca 1.5 cm long, Anther tails short, woolly. Achenes muricate and sparsely villous. Pappus pale brown, 1.2 cm long, outer pappus bristles scabrid or absent.

Fl. & Fr. Sept. - Oct.

Distrib. India: E. Himalayas, on open places in alpine regions, amidst boulders, 3800-4800 m. Arunachal Pradesh and Sikkim.

Nepal.

56. Saussurea taraxacifolia Wallich ex DC., Prodr. 6: 532. 1838; Hook.f., Fl. Brit. India 3: 368. 1881. (taraxicifolia) *S. caespitosa* Wallich, Cat. 2913. 1831; *Aplotaxis caespitosa* DC., Prodr. 6: 539. 1838 (p.p.) *Cyathidium taraxacifolium* Lindl. in Royle Ill. Bot. Himal. 251. t. 56. f. 2. 1835.

Stems absent or 2.5-15 cm high, glabrous or cottony at base, covered with withered remains of old leaf stalks. Leaves 10-20 x 1-2.5 cm, mostly radical, spreading, runcinate-pinnatifid, green and glabrous above, white tomentose beneath; lobes, triangular, acute, all pointing downwards, tips mucronate; shortly stalked. Heads solitary, 1.2-3.7 cm across, glabrous or sparsely cottony, solitary. Involucral bracts lanceolate. Receptacle densely bristly. Corolla ca 1.2 cm long, purple. Anther tails short, woolly. Achenes glabrous. Outer pappus hairs pale brown, few, scabrid.

Fl. & Fr. Aug. - Sept.

Distrib. India: Himalayas, 3500-4000 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh.

Nepal, Bhutan, S. China and Tibet.

57. Saussurea thomsonii C.B. Clarke, Comp. Ind. 227. 1876; Hook.f., Fl. Brit. India 3: 366. 1881.

Herbs, dwarf, stemless, with fusiform roots, crown very short. Leaves obovate or oblong, coriaceous, obtuse at apex, entire or obtusely toothed at margin, 1.2-3.7 cm, sessile or narrowed into a short, thick petiole. Heads subglobose, densely clustered, ca 1.2 cm across, sheathed by rounded floral leaves which are much shorter than the involucre. Involucral bracts purplish, obovate-oblong, obtuse, glabrous. Receptacle fimbrillate. Corolla ca 6 mm long. Anther tails short, entire. Achenes ca 3 mm long, glabrous. Pappus brown double, both feathery, ca 6 mm.

Fl. & Fr. Aug. - Sept.

Distrib. India: W. Himalayas in alpine regions, amidst boulders, 5600-6000 m. Jammu & Kashmir.

China.

58. Saussurea tridactyla Sch.-Bip. ex Hook.f., Fl. Brit. India 3: 377. 1881.

Herbs, 7.5-15 cm high, densely clothed with matted wool, simple, clavate, leafy. Leaves linear or linear-obovate or spathulate, obtuse, entire or obtusely 3-6-lobed at

apex, 1-3 cm, densely woolly on both surfaces. Heads deep purple, partially exposed, 2.5-4.5 cm across. Involucral bracts linear-oblong, acute, shining. Corolla ca 5 cm. long. Achenes narrow, 5-angled. Pappus pale brown, almost invariably single; outer pappus absent or of a very few scabrid bristles.

Fl. & Fr. July - Aug.

Distrib. India: E. Himalayas, in alpine meadows, 4600-5600 m. Sikkim.

Nepal, Bhutan and S.E. Tibet.

59. Saussurea uniflora (DC.) Wallich. ex Sch.-Bip. in Linnaea 19: 330. 1846; Hook.f., Fl. Brit. India 3: 366. 1881. *Aplotaxis uniflora* DC., Prodr. 6: 539. 1838.

Herbs, laxly villous, 30-60 cm high. Basal leaves linear-oblong or obovate, 10-20 cm, long petioled; cauline 8.5-13.5 x 3.5-4 cm, acute-acuminate, toothed, half amplexicaul, sessile. Heads purple, campanulate, solitary or upto 5, ca 3.5 cm across, subsilky; peduncle stout. Involucral bracts purple, ovate-lanceolate, with long narrow tips. Corolla ca 1.3 cm long. Anther tails laciniate. Achenes ca 4 mm, glabrous. Pappus brown; outer bristles scabrid.

KEY TO THE VARIETIES

1a.	Heads solitary or rarely two	**59.2. var. uniflora**
b.	Heads 3-5	**59.1. var. conica**

59.1. var. conica (C.B. Clarke) Hook.f., Fl. Brit. India 3: 366. 1881. *S. conica* C.B. Clarke, Comp. Ind. 224. 1876.

Fl. & Fr. Sept. - Oct.

Distrib. India: E. Himalayas, 3300 m. Sikkim and W. Bengal.

Bhutan.

59.2. var. uniflora

Fl. & Fr. July - Oct.

Distrib. India: E. Himalayas, on open slopes and amidst shrubs, 3000-4700 m. Sikkim.

Nepal, Bhutan and S.W. China.

60. Saussurea wernerioides Sch.-Bip. ex Hook.f., Fl. Brit. India 3: 367. 1881. *Saussurea subulata* C.B. Clarke, Comp. Ind. 226. 1876. p.p.

Herbs, dwarf, densely tufted, with ca 30 cm long root, crown with many tufted branches, 1.5-2.5 cm long, together forming cushions. Leaves erect or spreading, lanceolate, subulate at tip, toothed at margins, 0.6-1.3 cm, coriaceous, glabrous and glossy above, densely tomentose beneath, narrowed into densely imbricating sheathing petioles. Heads solitary, amongst the leaves, 1-1.5 cm across, sessile. Involucral bracts lanceolate-acuminate, rigid or broad, concave. Receptacular bristles rigid, scabrous. Corolla ca 6 mm. Anther tails long, woolly. Achenes very small. Pappus doubel, both feathery.

Fl. & Fr. Sept.

Distrib. India: Himalayas, in alpine regions on open slopes, amidst boulders, 3800-5300 m. Jammu & Kashmir and Sikkim.

Nepal, Bhutan, S. Tibet and S.W. China.

61. Saussurea yakla C.B. Clarke, Comp. Ind. 227. 1876; Hook.f., Fl. Brit. India 3: 368. 1881.

Herbs, dwarf, stemless, with woody rootstock. Leaves linear-oblong, 25.0-38.0 x 5.5-6.5 cm (9.5-10.0 x 5.5-7.5 cm), pinnate or pinnatifid, membranous, (flaccid), puberulous above, white tomentose beneath, sessile or petioled, lobes or segments broadly ovate or subtriangular, sinuate-toothed, tips and teeth mucronate. Heads 1-3, 2.5-7.5 cm across, pubescent or glabrate, sessile. Involucral bracts pale, narrowly lanceolate, acuminate, membranous. Receptacular bristles long. Corolla ca 2.5 cm long. Anther tails laciniate. Achenes tetragonous, ca 4 mm, muricate, crown strongly cupular. Pappus brown, ca 1.9 cm; outer pappus hairs absent.

Fl. & Fr. Sept. - Oct.

Distrib. India: E. Himalayas, on open hill slopes, subalpine to alpine regions, 3500-5300 m. Sikkim.

Nepal, Bhutan and Tibet.

18. Serratula L.

Herbs, perennial. Leaves alternate. Heads homogamous, corymbose. Flowers purpie, violet or white, all bisexual, similar. Involucral bracts many-seriate; outer shorter, broader, usually acute or awned; inner narrow, elongate. Receptacle bristly. Filaments glabrous; anther bases sagittate. Styles hairy. Achenes glabrous, oblong. Pappus bristles many-seriate, rigid, serrulate.

Europe, Japan; ca 70 species, 1 in India.

Serratula pallida DC., Prodr 6: 670. 1838; Hook.f., Fl. Brit. India 3: 379. 1881.

Herbs, 0.3-1 m high, glabrous or scaberulous. Stems simple, sparingly branched, stout or slender; branches ending in long leafless 1-headed peduncles. Leaves very variable in size, broadly ovate or oblong, acute or obtuse at apex, cut into short lobes at base, entire or toothed or deeply runcinate pinnatifid at margins 11-30 x 10-15 cm, glabrous or pubescent when young. Heads 2.5-3.5 cm across; peduncles often ca 45 cm long. Involucral bracts appressed, glabrous; outer ovate, acute; inner linear-oblong with scarious, obtuse tips. Receptacular bristles longer than achenes. Corolla ca 1.8 cm long. Anther tails short. Achenes obovoid-oblong, ca 5 mm long, obscurely ribbed. Pappus hairs brownish, rigid, ca 8 mm long.

Fl. & Fr. May - June.

Distrib. India: 1500-3100 m. Jammu & Kashmir, Himachal Pradesh and Uttar Pradesh.

Nepal

Note. Leaves very variable, entire to pinnatifid.

19. Silybum Vaill. ex Adans.

Herbs, erect, glabrous. Leaves alternate, sinuate-lobed, spinescent. Heads homogamous, large, subglobose, solitary, terminal, nodding. Flowers purple, bisexual, similar, fertile. Involucral bracts many-seriate, broad, fimbriated with spines below, terminating in spreading, rigid spines above. Receptacle flat, densely bristly. Filaments glabrous, united into a sheath below; anther bases sagittate. Style subentire. Achenes obovoid-oblong, compressed, glabrous. Pappus hairs many-seriate, unequal, subpaleaceous, united at base into a deciduous ring.

Mediterranean region; 2 species, 1 in India.

Silybum marianum (L.) Gaertn., Fruct. & Sem. 2: 374. t. 168. 1791; Hook.f., Fl. Brit. India 3: 363. 1881. *Carduus marianus* L., Sp. Pl. 823. 1753. **Fig. 54.**

Eng.: *Milk Thistle, Holy thistle.*

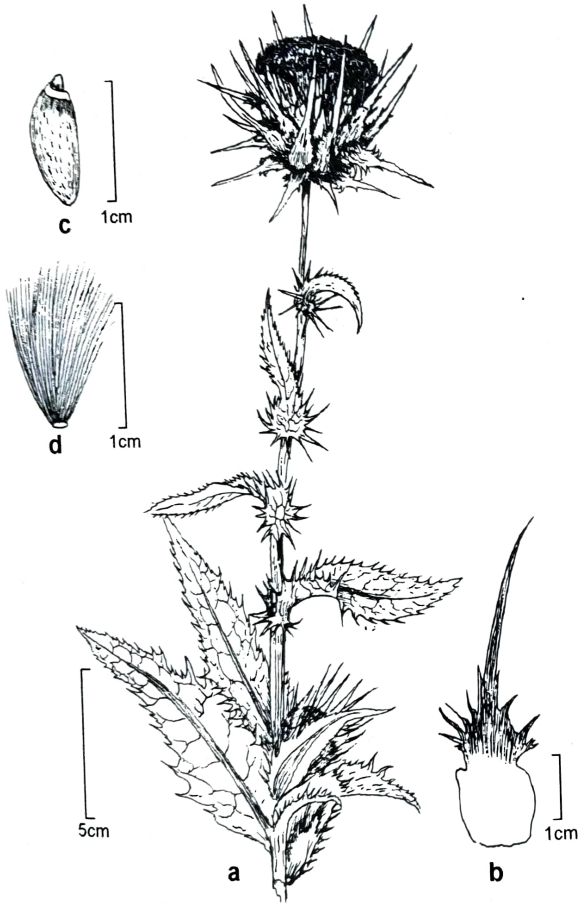

Fig. 54. Silybum marianum (L.) Gaertn. : a. Habit; b. Involucral bract; c. Achene; d. Pappus.

Annuals or biennials 0.3-1.2 m tall. Leaves white veined, large, with strong spines; basal leaves 28-70 x 14-30 cm; cauline 7-18 x 2-7 cm. Heads 2.5-6.5 cm across. Involucral bracts coriaceous, spiny; spines 1.2-1.8 cm long. Receptacle fleshy. Flowers rose purple. Achenes black or grey, ca 6-8 mm long, transversely wrinkled. Pappus white, 1.5-2 cm long.

Fl. & Fr. May - Sept.

Distrib. India: 300-1700 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Tamil Nadu.

Pakistan, N. Africa and Europe.

Note. Young shoots are boiled and eaten during spring. Seeds are roasted and used as substitute for coffee.

20. Tricholepis DC.

Herbs, unarmed annual or perennial. Leaves entire, toothed or lower pinnatifid. Heads homogamous, usually ovoid, solitary, terminal, peduncled. Flowers yellow, red or purple. all bisexual, similar, fertile. Involucral bracts many-seriate, very narrow, usually with long recurved hair points or mucronate; outer shorter. Receptacle densely bristly. Filaments papillose; anther bases sagittate, auricles connate, tails slender, lacerate. Style arms slender. Achenes oblong or obovoid, glabrous, smoth, ribbed. Pappus bristles many-seriate, very unequal, serrulate, barbellate or feathery, long, slender or short and paleaceous or absent.

C. Asia, Myanmar; ca 15 species, 10 in India.

KEY TO THE SPECIES

1a.	Pappus usually absent	2
b.	Pappus usually present	3
2a.	Herbs, 0.9-1.5 m heads 1.8-2.5 cm across	**1. T. amplexicaulis**
b.	Herbs, 15-50 cm high; heads 0.8-1.2 cm across	**2. T. angustifolia**
3a.	Corolla yelLow; pappus hairs connate at base	4
b.	Corolla red or lilac; pappus hairs not connate at base	7
4a.	Receptacular bristles equalling the feathery pappus	**6. T. karensium**
b.	Receptacular bristles usually shorter than feathery pappus	5
5a.	Pappus very slender, inner ca 2.5 cm long	**4. T. furcata**
b.	Pappus 6-8 mm long	6
6a.	Leaves quite glabrous	**8. T. stewartii**
b.	Upper surface of leaves covered with raised points or scaberulous or pubescent	**3. T. elongata**
7a.	Achenes twice as long as pappus hairs	8
b.	Achenes equalling or shorter than pappus hairs	9

8a. Receptacular bristles longer than achenes — 7. T. radicans
b. Receptacular bristles shorter than achenes — 5. T. glaberrima
9a. Pappus a brush of compressed bristles, twice as long as achenes — 10. T. tibetica
b. Pappus of slender feathery hairs, equalling achenes — 9. T. stictophyllum

1. Tricholepis amplexicaulis C.B. Clarke, Comp. Ind. 240. 1876; Hook.f., Fl. Brit. India 3: 381. 1881.

Herbs, erect, stout, glabrous, 0.9-1.5 m tall; stems rigid; branches angled, ribbed, quite smooth, shining. Leaves linear-oblong, 7.5-12.5 x 1.2-5.7 cm, quite glabrous, pale when dry, half amplexicaul at base. Heads 1.8-2.5 cm across; peduncles short, stout, angular, bracteate by linear leaves. Involucral bracts acicular, recurved, often tipped with black. Receptacular scales longer than achenes. Corolla 1.2-1.6 cm long. Achenes pale brown, compressed, ca 5 mm long, perfectly smooth, glossy. Pappus absent or of a few bristles.

Fl. & Fr. Oct. - Feb.

Distrib. India: Maharashtra, Karnataka and Kerala.

2. Tricholepis angustifolia DC., Prodr. 6: 564. 1838; Hook.f., Fl. Brit. India 3: 382. 1881.

Herbs, 15-50 cm high, very slender, quite glabrous; branches spreading, angled, quite smooth. Lower leaves lower obovate; upper linear-oblong, entire or subserrate at margins, sessile. Heads ovoid, ca 0.8-1.2 cm across, peduncles slender. Involucral bracts acicular, recurved, glabrous. Receptacular bristles longer than achenes. Achenes oblong, ca 3 mm long,smooth, faintly ribbed. Pappus absent.

Fl. & Fr. Oct. - Dec.

Distrib. India: Karnataka and Kerala.

3. Tricholepis elongata DC., Prodr. 6: 563. 1838; Hook.f., Fl. Brit. India 3: 380. 1881. **Fig. 55.**

Herbs, perennial, 60-150 cm tall, pubescent or scaberulous, sparingly branched. Leaves very variable in shape and size, linear, oblong-lanceolate, elliptic or obovate, acute or obtuse at apex, toothed, serrate or distantly runcinate, 5-10 x 1.5-4.5 cm, covered with raised points on the surface or scaberulous or pubescent,sessile. Heads 1.2-5.0 cm across. Involucral bracts acicular, tips ciliate. Receptacular bristles longer than achenes. Corolla yellow, 1.2-1.6 cm long. Achenes narrowly oblong, ca 5 mm long, acutely 5-angled, slightly broader upwards, truncate, smooth. Pappus hairs pale brown, ca 6 mm long, in many rows, pale brown, shining.

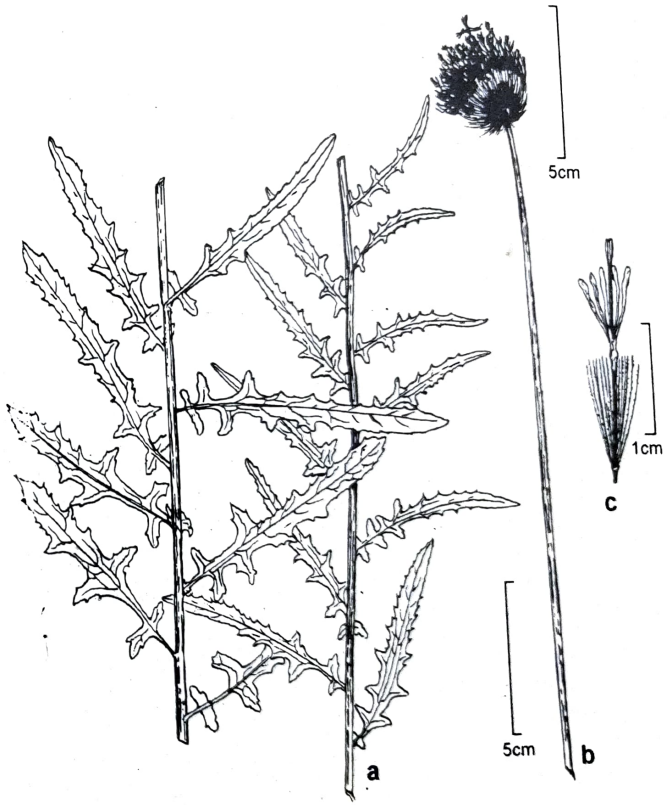

Fig. 55. Tricholepis elongata DC. : **a.** Habit; (Portion of a plant; **b.** Inflorescence; **c.** Floret.

Fl. & Fr. May - Sept.

Distrib. India: W. Himalayas, 1300-2800 m. Jammu & kashmir, Himachal Pradesh and Uttar Pradesh.

4. Tricholepis furcata DC., Prodr. 6: 563. 1838; Hook.f., Fl. Brit. India 3: 380. 1881.

Herbs, 0.6-1.8 m tall, slender, glabrous or puberulous, branched; branches from the base, elongate. Leaves elliptic or lanceolate, acute or acuminate at apex, denticulate at margin; 5.0-15.0 x 3.5-6.0 cm, smooth or scaberulous above, pubescent beneath. Heads ca 3.5 cm across, nodding, ebracteate; peduncles long. Involucral bracts acicular or filiform, recurved, ciliate tips black, spreading in fruit. Receptacular bristles shorter than achenes. Corolla yellow, 1.8-2.5 cm long. Anther tails subentire. Achenes pale, compressed, ca 5 mm long, ribbed, smooth. Pappus hairs white; very slender, soft, inner ca 2.5 cm long, scabrid, connate at base.

Fl. & Fr. June - Sept.

Distrib. India: Himalayas, in temperate to subalpine regions, 1600-3300 m. Jammu & Kashmir, Himachal Pradesh, Uttar Pradesh and Sikkim.

Nepal, Bhutan and Pakistan.

5. Tricholepis glaberrima DC., Prodr. 6: 754. 1837; Hook.f., Fl. Brit. India 3: 381. 1881.

Herbs, ca 1 m high, erect, rigid, quite glabrous; branches slender, angled, ribbed, quite smooth. Leaves linear-oblong or lanceolate, quite entire or serrate at margins, scaberulous, simple or auricled at base. Heads 6-8 mm across. Involucral bracts subulate. Receptacular bristles exceeding pappus. Achenes oblong, twice as long as pappus, faintly distantly ribbed. Pappus short, conspicuous.

Fl. & Fr. Oct. - Jan.

Distrib. India: Madhya Pradesh, Rajasthan, Maharashtra, Karnataka and Tamil Nadu.

6. Tricholepis karensium Kurz in J. Asiat. Soc. Bengal 41(2): 318. 1872; Hook.f., Fl. Brit. India 3: 380. 1881.

Herbs, tall, erect, woody, villous. Upper leaves lanceolate, entire or denticulate at margins, 7.5-10.0 cm long, pubescent or cottony beneath. Heads ca 6 cm across, bracteate by upper leaves. Involucral white many bracts quite acicular, elongate-subulate,

spreading, incurved, rigid; outermost ca 4 mm long, rigid, densely ciliate with spreading hairsinner gradually larger; innermost ca 3.5 cm long. Receptacular bristles linear, equalling pappus. Achenes 4-5-ribbed, smooth. Pappus hairs barbellate, connate at base; outer short.

Fl. & Fr. June - Sept.

Distrib. India: Jammu & Kashmir and Himachal Pradesh.

Myanmar.

7. Tricholepis radicans (Roxb.) DC., Prodr. 6: 584. 1838; Hook.f., Fl. Brit. India 3: 381. 1881. *Carduus radicans* Roxb., Fl. Ind. 3: 408. 1832.

Kan.: *Kusube gida.*

Annuals, much branched, 15-50 cm high, slender, glabrous smooth or scaberulous; branches decumbent or erect, angular, stout. Leaves linear, obovate, oblong or spathulate, remotely irregularly toothed or pinnatifid, 2.5-8 x 1.5-2.5 cm, membranous; teeth mucronate or with pointed bristles. Heads 1.2-1.6 cm across; peduncles slender. Outer involucral bracts acicular; inner more lanceolate. Receptacular bristles longer than achenes. Corolla lilac, ca 8 mm long. Achenes pale or shining, ovoid or oblong, compressed, ca 5 mm long, smooth, truncate. Pappus hairs pale brown, scabrid.

Fl. & Fr. Sept. - Jan.

Distrib. India: On rocky ground, usually on mountain slopes or as weed of cultivated fields. Rajasthan, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu.

8. Tricholepis stewartei C.B. Clarke ex Hook.f., Fl. Brit. India 3: 380. 1881.

Branches rigid, leafy. Leaves lanceolate, acuminate at apex, minutely toothed at margins, ca 3.5 cm long, coriaceous, quite glabrous. Heads ca 2.5-3 cm across, peduncled. Involucral bracts acicular; inner ca 1.8 cm long. Receptacular bristles longer than achenes. Pappus rigid.

Fl. & Fr. Sept. - Oct.

Distrib. India: W. Himalayas, 1200 - 2700 m. Jammu & Kashmir.

Pakistan.

9. Tricholepis stictophyllum C.B. Clarke, Comp. Ind. 241. 1876; Hook.f., Fl. Brit. India 3: 382. 1881.

Herbs, perennial, subscapigerous, quite glabrous. Stems absent or 15-30 cm long, sparingly branched from base; branches angular, grooved, leafy below. Leaves linear or ligulate, quite smooth, quite entire or obscurely toothed at margins, 7.5-12.5 x 0.6-1.2 cm, half amplexicaul, sessile; nerves parallel. Heads rarely 2 together, 2.5-3.5 cm across, glabrous. Involucral bracts 1.2-1.6 cm long, appressed, glabrous; outer ovate acuminate; inner linear-lanceolate with erect flexuous tips. Receptacular bristles longer than achenes. Corolla ca 1.5 cm long, straight. Achenes pale, linear-oblong, ca 8 mm long, rounded at margins, many-ribbed, truncate. Pappus silvery brown, ca 8 mm long, soft.

Fl. & Fr. March - April.

Distrib. India: on grassy slopes. Uttar Pradesh and Madhya Pradesh.

Myanmar.

10. Tricholepis tibetica Hook.f. & Thomson in C.B. Clarke, Comp. Ind. 241. 1876; Hook.f., Fl. Brit. India 3: 382. 1881.

Annuals, ca 30 cm high, corymbosely branched, quite glabrous, woody below; branches slender, erect, cylindric, quite smooth. Leaves very narrow, obtuse at apex, 2.5-7.5 cm long, coriaceous, sessile; lower leaves distantly pinnatifid; upper ovate, linear, entire. Heads 1.2-1.6 cm across, scaberulous. Involucral bracts appressed, minutely scabrid; outer ovate-subulate; inner subulate-lanceolate, ca 1.2 cm long, rigid, suberect. Receptacular bristles longer than achenes. Corolla red, ca 1.5 cm long. Achenes silvery, linear-oblong, ca 4 mm long, obscurely ribbed. Pappus hairs nearly white, ca 8 mm long.

Fl. & Fr. July - Aug.

Distrib. India: W. Himalayas, in rock crevices, ca 2,500-3,000 m. Jammu & Kashmir.

Pakistan and Afghanistan.

EXCLUDED SPECIES

Tricholepis chaetolepis (Boiss.) Rech. f. in Öesterr. Bot. Zeitschr. 97: 251. 1950. *Jurinea chaetolepis* Boiss., Diagn. ser. 23: 50: 1856. *Tricholepis spartoides* C.B. Clarke, Comp. Ind. 241. 1876.

Distrib. India: Jammu & Kashmir.

Pakistan and Afghanistan.

Note. There is no specimen available in Indian herbaria.

Tricholepis montana Dalz. & Gibs. Bombay Fl. 131.

Distrib. India: Maharashtra.

Note. Hook.f. (1881) has included as doubtful and imperfectly known species.

Tricholepis nakaoi Kitam. in Acta Phyto. Geobot. 19: 105. 1963. f. 59. 1964.

Distrib. India: Jammu & Kashmir.

Tricholopis roylei Hook.f., Fl. Brit. India 3: 383. 1881.

Note. There is no specimen available in Indian herbaria.

21. Zoegia L.

Herbs, erect. Radical leaves pinnatifid; cauline entire. Heads heterogamous, long peduncled. Outer florets 1-seriate, neuter. Disc florets bisexual, fertile; tube slender, limb 5-fid to or below the middle. Involucre globose or ovoid; bracts membranous, many-seriate; outer shorter, pectinately ciliate; violet inner entire, tips ciliate. Receptacle densely bristly. Filaments glabrous; anther bases sagittate. Style entire or emarginate. Achenes obovoid, compressed, shining, obscurely ribbed. Pappus double or triple; outermost of short chaffy scales; middle with long bristles; inner of short bristles.

S.W. & C. Asia; ca 6 species; 1 in India.

Zoegia purpurea Fresen. in Mus. Senckenb. 86. 1833; Hook.f., Fl. Brit. India 3: 384. 1881.

Herbs, 20-30 cm high, slender, glabrous or puberulous. Involucral bracts with bright purple tips. Achenes with concentric ridges below the tip.

Distrib. India: W. Himalayas, ca 1600 m. Jammu & Kashmir.

Pakistan, Afghanistan, Iran, Saudi Arabia and Egypt.

Note. Very rare; there is no collection in Indian herbaria.

EXCLUDED SPECIES

Dolomiaea baltalensis Dar & Naqshi in J. Bombay Nat. Hist. Soc. 87: 279. 1990.

Note. The species is described on minor variation in vegetative characters (i.e. shape and lobation of leaves, nature of woolliness, size of peduncle and darker heads. Therefore it could be just variant of *Jurinea macrocephala.* As the author could not examine the type specimen it is presently excluded from the main treatment.